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ARCHITECTVRE

ENGINEERING

DECORATION

CONSTRVCTION

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REVIEW OF THE PRINCIPLES OF SANITARY PLUMBING AS NOW ACCEPTED BY ALL LEADING SANITARIANS.

THE main object to be attained is the complete removal of waste matters from the premises the instant they are generated. This can only be accomplished by observing the following rules:—(1.) Avoid all cesspools. (2.) Make all waste-passages as small as possible to effect their purposes. (3.) Construct every fixture on the principle of the flush-tank. (4.) Make every trap seal-retaining and self-scouring. (5.) Make all joints tight. (6.) Select the simplest appliances and the simplest system consistent with safety. These rules are self-evident enough to be accepted as plumbing axioms, and are sufficient to produce perfect work. The "Sanitas" Appliances have been constructed with a view to their fulfilment in every respect, and an examination of the steps leading to the development of these appliances will best illustrate the principles of Sanitary Plumbing, showing the faults which should be avoided, and the objects which should be sought.

Beginning with the trap: In the first place mechanical seals have been discarded as being unreliable, unnecessary, and as obstructing the water-way. We start with the simplest form of water-seal trap, the ordinary S-trap. This

trap answers all our requirements except that it has no power to retain its seal under the variations of atmospheric pressure occuring within the waste-pipes. To remedy this deficiency the pot-trap was developed from the S-trap by simply enlarging its upcast limb, a sufficient enlargement gives it a temporary power of resistance, but creates a cesspool having no self-cleansing power and, accordingly, the trap clogs, under sinks, with grease and ultimately loses its original resisting power. To avoid this difficulty we have turned the pot-trap on its side and reduced the size of its body. This permits the air to pass through the trap above the water without driving the latter out before it, as would be the case with a perpendicular body equally reduced in diameter. To still further increase the power of resistance to siphonage the body was next bent into a quadrangle, giving several reflecting surfaces, which throw back this water under siphoning action while they allow the air to escape, and, finally, the two parallel sides of the quadrangle were merged into a single body having a reflecting partition and a large clean-out cap. This gives us the perfected Sanitas-Trap, which has proved itself to be both anti-siphonic in properly arranged plumbing-work and substantially self-cleansing either with or without venting. It is more resisting than a vented S-trap.

The Sanitas Is a Scientific System of Plumbing, having Simplicity and Safety for its Basis. It is also by far the most Economical System.

SANITAS

PLUMBING APPLIANCES

Avoid Infringements and Imitations which are described as being "as good as the 'Sanitas;'" they are not, they are very inferior as well as illegal.

Considering next the Lavatory. These should always be constructed on the principle of the flush-tank, their discharges filling the water-passages "full-bore," so as to keep them clean. The overflow and outlet passages should be combined in the form of a stand-pipe, thus doing away with the usual foul, inaccessible and badly jointed lead overflow-pipe, and the troublesome and dirty plug and chain. The stand-pipe should be operated by a simple mechanism above the slab, for convenience and cleanliness, requiring but a single movement of the hand, and all parts should be of solid and durable construction, while the stand-pipe should be easily detachable for cleansing. The Sanitas Lavatories are all constructed after this principle, and they are the first ever so constructed. The stand-pipes are made of either plated metal or of earthenware, like the fixture itself, and the whole device produces a very ornamental effect, especially when decorated in colors to correspond with the decoration of the earthenware bowl. Finally, the ideal water-closet should have the simplicity of the short-hopper, with the sanitary advantages and convenience of the improved modern closets. More than this, it should be practically noiseless, anti-siphonic, quick-acting, self-sealing, and free from spattering or waste of water. These desiderata have been attained in the Sanitas Water-Closet of which we sketch the outline in section. The supply-pipe between the cistern and the closet discharges into the latter below the level of its standing water, and being without air-pipe, stands permanently full of water, hence the action is instantaneous and the noise of flushing is deadened. This and the peculiar construction of the flushing-rim and water-supply passages cause the waste to be discharged with wonderful speed and effectiveness; and at the same time so quietly that with the cover down and the toilet-room door closed, no sound of flushing can be heard from without. The closet is highly ornamental in appearance, hence no other wood-work is required than the seat and cover, and these may be supported directly on the earthenware itself, which is constructed with this in view. The Sanitas System, taken together, is the most economical as well as the only safe system of plumbing, as avoiding the dangers and complication of special trap venting. Whether vented or not it is now admitted that safety requires a trap to be *anti-siphonic*, the vent-pipe alone not being reliable. The Sanitas Trap holds sufficient water to resist, when properly set, any *back pressure* that can occur in good plumbing with properly vented soil-pipes. For more detailed description and illustration of the Sanitas Appliances, see our other Advertisements and the Circulars of

THE SANITAS MANUFACTURING CO., BOSTON.

T. H. DUGGAN, 141 Dartmouth Street, BOSTON, MASS. TELEPHONE, 4165 — Will execute anywhere, in first-class manner, small or large contracts for **PLUMBING.**

THE AMERICAN ARCHITECT AND BUILDING NEWS.

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WE learn with much regret of the death, at the early age of twenty-four, of Mr. James S. Trowbridge, of Cincinnati, one of the most conspicuous among the young architects of a city which is second to none in the ability and enthusiasm with which our profession is practised. Mr. Trowbridge, after his school-days in Cincinnati were over, entered the office of Mr. Edwin Anderson, and, under his kind care, rapidly advanced in the art which he had chosen, and had attained remarkable skill as a draughtsman, as well as an intelligent comprehension of ordinary construction, before entering the Massachusetts Institute of Technology for a finishing course. On completing this, after staying in Cincinnati for a few months, he sailed for Europe, where he spent a year in sketching and study, and on his return soon found himself busily engaged in the practice of the profession for which he had equipped himself so thoroughly. In the midst of his work he was seized with typhoid fever, and died just as the most brilliant professional prospects had opened before him. It is not for us to question the will of Providence, or to set temporal affairs against the purposes of eternity, but we must at least, while rejoicing that there are so many others of similar character left to us, mourn deeply the loss of one so well fitted to lead among the faithful, sober and accomplished young men to whom is entrusted the future of American art.

A CURIOUS point of law is reported to us by the kindness of the architects interested. Some time ago these gentlemen were commissioned to draw plans for a skating-rink, and a contract was made with a local builder to erect it complete within two months, under forfeiture of one hundred dollars for every day's delay. The building was completed at the appointed time, but with certain defects in the shape of omissions and inferior work, which the architects refused to accept or to certify for. The owners took possession of the building, however, and occupied it for some months, when it was destroyed by fire. The contractor then brought suit for the unpaid balance of the contract price. The case was, by consent of the parties, decided by a referee, Judge Edwards, of Broome County, New York, who found that no certificate had, as the contract required, been given for the balance claimed; that the architects, in refusing the certificate, had acted in good faith and without collusion with the owners, and that the condition of the building warranted their refusal; that the building might have been constructed within the allotted time in substantial conformity with the plans and specifications, but was not so constructed, and that the omissions and defects were material deviations from the contract, and were intentional on the part of the builder; and he decided that the latter was "not entitled to recover in this action any part of the amount remaining unpaid upon the written contract, being the payment of thirty-one hundred and fifty dollars agreed therein to be paid him by the defendants when the work contracted for was finished and accepted by the architects by their written acceptance."

THE way of the walking-delegate in New York appears to be getting somewhat less comfortable than it has hitherto been. The great dealers in materials, who were savagely boycotted because they sold goods to another dealer, who sold other goods to some one else, whom the delegates did not like, are determined to prevent similar attacks on their business for the future by proceeding to the extremity of the law against their assailants; and other sufferers, encouraged by the attitude of the great wholesale dealers, are having their cases prepared for the courts. Meanwhile, the antics of the labor tyrants are attracting the attention of the Grand Jury, as well as of the civil courts, and an indictment for conspiracy has just been found against the Executive Committee of District Assembly 91. Some months ago the foreman of a shoe factory thought it his duty to discharge a member of this Assembly. The Executive Committee, with characteristic insolence, went to the proprietors of the factory, and demanded that their man should be reinstated, and the foreman discharged. This modest demand was refused, and the factory was struck. The proprietors held out for a time, but at last, rather than be ruined, yielded, and sent the foreman away, reinstating at the same time the man whose conduct originally caused the trouble. The Executive Committee of this man's assembly then began a systematic persecution of the foreman, chasing him out of successive shops, until he removed to Newburgh, sixty miles from New York, and engaged himself to a firm there, only to be notified, before he began his work, that the firm withdrew from its agreement, from fear of trouble with the Unions if it employed him. It is much to be hoped that a final stop will be put by means of this case to the practice of allowing irresponsible committees to amuse themselves by hunting men with families into poverty and starvation, for the sake of showing their own importance. For the benefit of those who like to nip such tyranny in the bud, we will mention a little story which we find in the *Sanitary Plumber*. According to this journal a walking-delegate, with his silk hat badly mashed, and his clothes bereft of their usual gloss, came into court the other day, and demanded satisfaction for an assault which, as he said, had been made upon him by the foreman of a Third Avenue factory. According to his story, he entered the factory, and told the foreman that he wished to explain something to him about the grievances of the men. The foreman declared that he did not want any explanations, and, when the delegate insisted upon making some, cut them short by seizing him by the neck and pitching him into the street, greatly to the detriment of his apparel. The judge listened attentively to the delegate's tale, and then informed him that the foreman did perfectly right, and that his complaint was dismissed.

THE Nicaragua Canal enterprise seems to be fairly launched, under excellent auspices, and Mr. Menocal's years of skilful labor are likely at last to bear some fruit. According to the careful estimates now presented, the canal which is to be finally staked out by the party which sailed from New York in the steamer "*Hondo*" last month, will cost less than sixty-five million dollars, and will offer a safe and easy passage from the Atlantic to the Pacific. Every one knows the peculiar topography of Nicaragua, by which the lake of Nicaragua, one hundred and ten feet above the sea, with the rivers flowing into and from it, are to be utilized as the principal part of the canal, leaving only forty miles of excavation to be done. So far as the United States is concerned, the Nicaragua route is probably preferable, the distance through it between the Atlantic and Pacific States being much less than by way of Panama; and there seems to be no reason why it should not be equally favorable for vessels steering from Liverpool or Genoa for China and Australia; so that the main obstacle to the speedy construction and profitable utilization of the canal appears to lie in the competition of the Panama and Tehuantepec routes. The latter seems for the present to be abandoned, but the Panama enterprise, notwithstanding all that is said about it, seems to have plenty of vitality left. For a time, the newspapers were full of predictions of its speedy collapse, and of

rumors of the reduction of the working force, and other alarming things; but within a few days Mr. Slavin, of San Francisco, the principal contractor for the work, has informed the reporters of the New York papers that the excavation is half done, that the Canal Company has plenty of money in its treasury, and that the work will unquestionably be carried out. Some of the reporters seem to have learned for the first time from him that the project of a sea-level canal had been abandoned, and that several locks were to be introduced, to diminish the amount of excavation; but the fact is that this change was made something like two years ago, and that the work has been proceeding on that plan ever since. It is certainly unfortunate that two rival companies should be spending such enormous sums of money on the same work. Whatever may be the traffic between the two oceans, it is not likely to be large enough to pay more than a fair dividend on the cost of one canal, and to set two companies competing for it is a sure way to ruin the stockholders of both. In a recent book, Mr. Laurence Oliphant, in speaking of a visit which he once made to the Isthmus, mentions a valley intersecting the middle range of hills, which presented a pass so little elevated above tide-water that the Indians were accustomed to haul their canoes from sea to sea through it. Of course, if such a valley as this could be discovered at Panama, the problem of a sea-level canal would be solved, and the fearful task of cutting through the Culebra hill, with the little less difficult one of damming the River Chagres, would become needless; so that, if Mr. Oliphant had really any foundation for his statements, Mr. Menocal might perhaps with advantage take his surveying party in search of this route, and, if he found it, share the advantage of his discovery with the Panama Company.

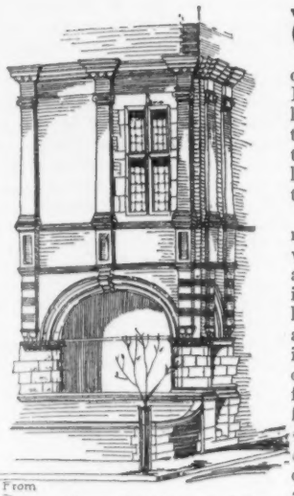
SOME curious observations have been made recently in Saint Petersburg in regard to the influence of the electric-light upon plants. It was observed long ago that flowers and plants used as decorations for the evening in rooms illuminated with electric arc-lights preserved their freshness much better through the evening than in rooms lighted with gas or candles; and one of the Siemens brothers made some experiments with electric-light in a greenhouse, from which he found that plants would grow at night under such circumstances. Later, a similar experiment was carried out on a large scale, a greenhouse being brilliantly lighted by electricity every night for some months; but the result was disastrous to the plants. Although they grew rapidly in some cases, the growth was soft and unhealthy; no flowers came, and the over-developed plants one by one died of mildew or decay. Last year the electric-light was introduced into the Winter Palace at Saint Petersburg, and with Russian luxury, a profusion of lamps was scattered through the great reception-rooms, filling them with a blaze of light. During the season, the principal rooms are decorated with hundreds of plants, palms, camellias, laurels and roses, which are usually kept there through the winter. Under the influence of the electric-light, however, all the plants began to show signs of suffering in a few days after they were set in place. The leaves turned yellow, and dropped off in showers, in some cases showing black, burnt spots like those often seen on leaves exposed too suddenly to a hot sun. The effect in general was like that which would follow from suddenly removing the shading in midsummer from a greenhouse full of plants, and many of them died outright, while others were so much injured that it will be years before they recover. Although it is probable that the dryness of the atmosphere in a Russian house in winter had something to do with the effect, the important part played by the electric-light was demonstrated by the fact that some of the plants, which stood in niches, sheltered from the direct rays, were not injured.

MANY architects, as well as farmers, will rejoice at the decision of the United States Supreme Court, which declares the patent of Nelson W. Green, for the process of drawing water from the earth by driving a tube down to the water-bearing stratum, to be invalid. The basis of the decision is the fact, proved by evidence, that driven wells of this kind were in use in New York State two years before the date of Colonel Green's patent. As everybody who took any interest in the subject knew years ago that driven wells by the score had been sunk before the date of the Green patent, and that the patent was for that reason invalid, we imagine that the most conspicuous result of the decision will be the calling of public attention very forcibly to the disgraceful delays of justice which have become characteristic of this country. Ever since the issue of the patent, which never had any validity, and which a great many people must have known at the time to be worthless, the patentee and his representatives have been collecting royalties at exorbitant rates, on driven wells all over the country, and have, in the fifteen years which have elapsed between the granting of the invalid patent and the final declaration of its invalidity, amassed fortunes, which, under the law, they are not required to refund to those who have paid them money on a claim well known to be worthless. As the patent would have expired in a year or two, the moral of the story, which will not be lost on unscrupulous persons, is that an invalid patent, once granted, is just about as good for extracting money from the community as a valid one, and that, as the Patent Office examiners could not, even if they were not expected to leave that office to the courts, inquire into the originality of every device submitted to them, an earlier invention, which has not been patented, may be boldly appropriated, and, in the face of overwhelming testimony as to its previous use, be employed to collect tribute at discretion during the years which must elapse before an end can legally be put to the imposition.

FOR some reason, perhaps on account of the climate, or possibly because the Danish colonists on the east coast of England were more unruly than the Celtic Britons who had gradually been driven to the western part of the island, the western half of England seems to have been the most popular place of residence with the Roman masters of the country, and Roman remains, with Roman names, are found much more frequently on and near the Welsh border than elsewhere in Britain. At best the position of the Romans in the island seems to have been more like that of the French in Tonquin perhaps, or of the Belgians in Africa, than that of permanent settlers, so that the evidences of comfortable occupation are not very numerous, but in this district are occasionally found the remains of a villa, perhaps the residence of some official. One of the most complete of these yet discovered has just been found at Tockington, near Gloucester. Last year a laborer, who was at work digging a trench for the foundation of an enclosure for cattle at a farm, turned up with his spade some curious little stones of different colors. He put them in his pocket as curiosities, and showed them later to the steward of the estate, who at once recognized them as Roman tesseræ. At his suggestion, further excavations were made, and a beautiful Roman pavement exposed to view. The news of this discovery was communicated to the Bristol and Gloucestershire Antiquarian Society, which, with the consent of the lessee of the farm, commenced systematic explorations. Trenches were dug in parallel lines over the ground, and the walls of an extensive villa exposed, and it was further discovered that the present group of farm-buildings, which were arranged with a rectangularity not very common on English farms, occupied the site of a portion of the antique villa, so that the Roman masonry, still showing its characteristic construction, served as the lower portion of the walls of the modern buildings. As exposed by the excavations, the ancient structure had twenty-three rooms on the ground floor, six or seven of which still retain their beautiful inlaid pavements, of pieces of white and gray stone, mixed with bits of brick, cut to the shape required for the pattern. These pavements were laid upon a network of flues, forming the hypocaust generally used by the Romans in Britain for warming their rooms, and, in addition to this, terra-cotta pipes were found built into the walls, through which hot air was conducted to the rooms in the upper stories, in just the way that such pipes are still used in Paris. The condition of the walls, together with traces of charred wood found in various places, showed that the ancient buildings had been destroyed by fire, but portions of the roof-covering were found, consisting of large slates, two feet long and an inch thick, together with a few flanged terra-cotta tiles, which may have been used in repairs; and some of the plaster which covered the walls was found with remains of painted decoration still adhering to it. So far nothing has been discovered in the building in the way of portable property except some Samian pottery, a brass coin of one of the Roman governors, and an iron strigil; but, according to the *Builder*, from which we borrow the account, the work of exploration is to be continued, and further interesting discoveries may be made.

ART IN THE MODERN HABITATION.

ROME, November 12, 1887.



From
A New House in Queens Gate.
R. Norman Shaw. R.A. Archt

UNDER this title M. Lucien Magne, an architect of Paris, held at the Library of the Union Centrale des Arts Decoratifs a conference, which has already made on this side of the Alps a certain stir amongst that class of architects who follow with a lively interest the artistic movement in France.

The publishing-house of Firmin-Didot of Paris has printed with great elegance the doings at that conference, and to render it more intelligible the author has added numerous illustrations, as much for the sake of supporting the examples of modern architecture which he cites, as to furnish documentary evidence for that portion of his work consecrated to an historical *résumé* of art. This latter portion is certainly most curious reading, although, relating to our epoch, it offers a more immediate interest to us. But that which renders this conference worthy of the greatest praise is that, in spite of the thoroughly aristocratic luxury with which the book is bound and printed, it has a popularizing aim which is perfectly in conformity with the democratic tendencies of the epoch in which we live.

M. Magne rightly undertakes to refute the doctrine that art is confounded with luxury and only has an interest for the élite of society. He sets himself to prove that it is within the reach of everybody, that it ought to impress itself on every manifestation of social life, and that if it does not, this is because of an error of definition as much as of a vice of education. To successfully refute this, it is naturally necessary to overthrow certain prejudices as to abstract conceptions of art. Classic beauty so-called, for instance, is only a sham. Every work which is carried out under conditions of decorative elegance and which favors the rational employment of the material so as to give satisfaction to an idea or a need is a work of art. This is equivalent to saying that the line drawn up to the present time between the fine arts and the industrial arts has no reason for its existence. It is especially in architecture that work is generally the simultaneous interpretation of an idea and of utility. In the temple, the symbol expresses the idea, and the nave corresponds with the need. This does not prevent the Parthenon and Nôtre Dame de Paris from being works of art, with as good a claim to the title as the monument of Lysicrates or the Arc de Triom phe Starting from this, we can affirm that art has its place in all objects destined to the most ordinary of everyday uses, and this was to be seen, moreover, in the heyday of the gold-maker's art, when the tables glittered with candelabra and ladles which were pure *chefs-d'œuvre*. Among the Etruscans, even, the elegance of form and the love of decoration were apparent in the meanest of domestic utensils.

The study of ancient civilizations is necessary, then, for modern artists, because it permits them to understand what applications the resources of art allowed in antiquity, and from amongst these applications to reject those which are no longer in harmony with present customs, and to retain, on the other hand, those which are susceptible of advantageous adaptation to the needs of today. It is particularly in the study of the dwelling-house that the artist, and particularly the architect, can find precious indications as to the kind of civilization which prevailed amongst the ancient peoples. Nothing serves as the planning of a house to characterize the customs, the tastes, and even the sentiments of those who inhabited it. A Grecian house, of which only poets and historians have left us descriptions, evokes to our eyes through its intelligent distribution the image of the man who belonged before everything to the city, and who hardly allowed his family relaxations to pass beyond the sill of his gynæcium. The spacious atrium of the Roman house shows us a habitation whose owner rested his credit upon a numerous band of clients, and Pompeii, which — new phœnix — is born again from its ashes, revivifies for us this population of epicureans who led a life of pleasure, but who knew how to add to all forms of delights all kinds of graces. We discover here in the general lines of the architecture, as well as in the decoration, the delicate taste of Greek artists who had come in great numbers to these smiling shores; while at Rome, even, the delicate influences of Hellenic art mixed with that of ancient Etruria, more robust, more masculine, to form a style with two phases in which one easily discovers the traces of its different origins.

In the last centuries of the empire, the vast dependences of the Roman house declare the opulence and pride of the aristocracy, which, absorbed by public affairs, left to slaves almost the entire charge of the house; but later, when the triumph of Christianity had enfranchised the oppressed classes, the habitations took on a new character, which, nevertheless, remains vague and indefinite for a long time.

It is only toward the end of the eleventh century that society aspired to elevate itself, to know itself, and from that time its domestic architecture begins to claim our attention. There remain few specimens of this epoch; but from what we can see of it, we seem to recognize in the new organization that domestic life has taken a more important place. We already find in the centre of the apartment the *salon* devoted to the common gathering. We find under different latitudes similar forms of decoration, which reveal amongst peoples widely separated an identity of origin. How can we pass over in silence the striking analogy which exists between the ancient houses of Cluny and those of Viterbo, both of which antedate the twelfth century. Setting aside some differences in the disposition and decoration, differences which are justified by the different climates, we see that these dwellings, so widely separated from one another, are derived from the same style. At Viterbo the rooms receive light through windows which look on an interior court-yard. This is because here, under a burning sun, it is necessary to provide for a cool and agreeable outlook. We discover in like manner mosaics and mural paintings such as we saw at Pompeii, where the Greeks had introduced them, and which were derived originally from the Orient, for the employment of vivid colors, so glaring under gray skies, is almost a necessity in a country where the neutral tones make a most poverty-stricken contrast with the splendors of the ambient light. In Italy it is necessary to protect the rooms from the sun and heat; in France, on the contrary, to shelter them from the cold and rain. This is why the staircase, which at Viterbo opens on the street, here opens, on the contrary, into a court-yard, and wherefore up to the end of the eighteenth century, the fireplace held the place of honor in every house however cut up, and took on a monumental air in those where a spirit of luxury had the ascendant.

In the productions of French art at this time we notice the application of the law already cited, which declares that art, so far as concerns architecture, shall be the result of a need. In Greece where the columns ordinarily support only one story, the lightly-loaded capitals sustain the architrave or lintel, which in its turn distributes upon the columns the weight of the roof. In French art, superposition of stories gives birth to the arch, which has the air of being an ornamental device while in reality it represents a necessity of construction. At the same time differences in climate engender variety of needs. In the North, under a rainy sky, the walls are pierced by numerous openings to admit the light. The roofs are pitched at sharp angles so as to prevent deposit of snow and facilitate the flow of rainwater. Next came the gable, which, pierced with windows like the façades, often became a subject for ornamental treatment. The types of this class of house are still visible at Provins, at Vitteau, at Charlieu, and at St. Antonin. In the South we find, on the other hand, examples of buildings with roofs which project for the sake of producing a shadow over the façade and through the interior.

Almost always French architecture of the centuries which we have just mentioned has created monumental structures to which several buildings still bear witness, such as the House of Figeac, designed by Verdier; the House of the Musicians, at Rheims, whose upper story still bears statues which will stand comparison with the most beautiful of antique statues, and those not less remarkably preserved in the little city of Cordes, in Languedoc, where the Counts of Toulouse were wont to pass the summer. The house of Jacques Cœur, built in the reign of Charles VII, at Bourges, must not be omitted. Here we can criticise the extreme exuberance of the decoration; but then, we have already reached the fifteenth century: the manners are already softened, the dwellings are safer, and elegance takes the place of the accessories which were formerly consecrated to security. Openings are multiplied, and wood admirably answers for the new necessities of the dwelling. From the fourteenth century on we see façades built entirely of wood. In the centre of France we can still admire remarkable houses of this type entirely built of half-timber work, the panels being formed of combinations of brick, as at Lisieux; of tiles, as at Beauvais; of sculptured slabs of stone, as at Angers; or simply of a rough-cast of lime mortar.

Finally, we reach, at the end of the war with Italy, the epoch when French art allowed itself to be influenced by a reflection of foreign civilization. It at first borrows from foreign masters only the forms, mouldings and ornaments, but still preserves its own leading lines of structure; in spite of this invasion, it has still managed to preserve its own character: the Hôtel de Pincé at Angers, built in 1535 by Jean De l'Espine, gives evidence of this. This monument, still standing, bears witness that in the first half of the sixteenth century the national taste had not allowed itself to be overwhelmed by the mania for Italianism. It is only in the seventeenth century when the absolute power of the king centralized everything, the administration, politics, and also, alas, instruction, that the French building is almost entirely despoiled of its original character.

Paris still possesses on the Ile St. Louis a magnificent hôtel built by Le Van in the reign of Louis XIV, which bears in its design the undeniable marks of this degeneration; but it is especially in the following century that the route becomes complete. It is to the eighteenth century that the French architecture owes the plaster-ceiling, which, it is true, conceals the defects in the woodwork, but which replaces by a smooth commonplace surface those combinations

of beams and joists of so much use in decoration. It is to this same century that we owe the white-and-gold *salon*, — *baroque* and *rococo*, the too-narrow fireplaces whence the smoke escapes into the rooms, and finally the flat roofs and ill-designed gutters which deluge the ceilings and the walls with rainwater. We detect in the interior arrangements of the rooms traces of that effeminate and gallant society, where the life of the boudoir supplants the family life, and where stock-jobbing replaces honest and fruitful labor; where Nature no longer sees herself save in artificial gardens as at Versailles: these houses were quite worthy of an epoch when national honor practised a jeering philosophy, and when Voltaire, who angered Frederick the Great, took the trouble to insult the memory of Joan of Arc. Here is another instance of the way in which a revolution in morals and manners has produced a revolution in architecture. To-day the influence of custom upon art is stronger than ever. Under the Revolution, which rendered every citizen equal before the law, public wealth found itself better distributed, and every one sought in his own way a sufficient measure of elegant well-being. Even in houses of several stories every apartment is arranged like a little hôtel, offering all the desirable conveniences, vestibule, *salon*, dining-room, dwelling-rooms and rooms for servants. The humblest bourgeois of our time would blush to dwell in the inconvenient rooms of the most beautiful hôtel of the last century.

Unfortunately this love of luxury, of comfort, which might exercise a salutary influence on the art of construction by modifying the style, and by generalizing the application of the laws of æsthetics is complicated by a deplorable taste for "antiquities," so that modern taste is corrupted in its turn by association with historical reminiscences of the most dissimilar kind. We dream of bringing together in the same building a Pompeiian portico, a Henri Deux dining-room, a Louis Quatorze *salon*, a Louis Quinze boudoir. And as the methods at the disposal of our builders are changed, we can no longer reproduce these curiosities with the *cachet* which belongs to them, so that the incoherence of these reproductions is magnified by the defects of their execution. Beams are made of pasteboard, the monumental fireplace not having been built when the wall was built, its throat is too narrow and the smoke is not drawn up. Besides, in order to escape crushing the too feeble flooring, the fireplace is reduced to a simple arrangement of wood or iron clothed with plaster, but painted and gilded. Marbles are made of stucco, sculpture is pastry-work and windows are of transparent paper. This is what to-day is called art in the house.

Now is it true, as they say, that our time has no style? M. Magne believes, on the contrary, that it would be easy to reach the determination of a kind of construction which would properly characterize our time. For this it would first be necessary, according to him, to reduce the instruction in art to a small number of very simple rules, which should always be observed. To demonstrate that such instruction is possible, he himself formulates these laws by defining successively the lawful employments, so to speak, of the principal materials, such as stone, brick, terra-cotta, wood, wrought-iron, glass and painting. On this point we no longer agree with him. We have only a slight confidence in the efficacy of academic teaching of æsthetics. We comprehend scientific instruction which teaches what we call the technics of architecture; but it must be allowed to the artist to make innovations, to improvise, to step outside the limits of the commonplace; and how could this be the case when the preëstablished laws indicated beforehand the places assigned to the different materials in the buildings of the future. This reservation made, we must allow that the author has manifested in this part of his work an undeniable knowledge of all the difficulties and all the resources of architecture. For instance, for the last word as to the proportions of the dwelling, he has discovered a demonstration whose justness cannot be disputed. The house, made for the use of man, must have man for its scale of proportion. The human scale is a surer rule than the module of Vignola. From this law arises this conclusion, that the area and height of the rooms must be determined by the use to which the rooms are to be put. How many errors would be avoided if this simple rule were observed. Is it not useless to adapt the same height for the passage-ways as for a ball-room? Up to the sixteenth century French architecture gave to each room a height adapted to its use. This was one of the secrets of its originality. This law was only abandoned at a later period when everything was sacrificed to the exigencies of a false display.

We can hardly follow the author in the minute and learned study which he makes of the rational employment of materials. This would lead us to making a complete bibliography, which is not part of our project. Those who desire to thoroughly understand the ideas which he has developed on this subject, and which he supports by examples drawn from the most sumptuous buildings erected in Paris by modern architects, will have no difficulty in procuring the book of which we speak.

We will content ourselves with citing the conclusions of this conference which have a real importance. In the opinion of M. Magne the general laws which regulate architecture are imposed on all the industrial arts. Architecture is, then, the necessary base of instruction for all the arts, because it is the common ground for all the efforts which have a share in the execution of art-work. The lack of uniformity and of *ensemble* in industrial instruction creates certain regrettable inconveniences in practice. Every one pushes to excess the theory of the distribution of work, and plays his part without taking any regard for his neighbor, and the results are distressing discords. The joiner takes no thought for the locksmith, and neither one nor the other thinks of the mason. The result is that the masonry must be changed to receive the window-frames, and chases must be cut in the wood to admit the trimmings. If the school of design obeyed harmonious principles, the different pieces would adapt themselves to each other without struggle and weakening one another as they now do.

This general education ought to begin at school where, with the elements of designing, the pupils would be inoculated with the elementary notions of the arts which depend on it, not in view of abstract form, but in view of general combinations, which are necessary in every branch of art for the appreciation of the value of art-works.

In consequence of this pedagogic reform, the taste for elegance and the knowledge of æsthetics would be spread broadcast. Without realizing the dream of a nation entirely formed of artist citizens, we would generalize the artistic notions in such fashion that the artists would no longer form as they do to-day a close corporation. The essential, the indispensable thing is to render the teaching of art accessible to every one. These are theories which ought to be subscribed by those who are convinced that, in a democracy, be it understood, the cultivation of the ideal must be open to every one.

H. Mereu.

ACOUSTICS.

Palazzo Tolomei · Siena

THE following paper was read before the Association of Architects of Western Pennsylvania by Thomas Boyd, Architect, November 25, 1887.

Acoustics is the branch of natural philosophy which governs sound. It is divided into several parts, but it is the physical part of the subject which I wish to call your attention to, and especially in its effect on buildings.

This is a subject which we should all be interested in, as we have to deal with it more or less, and what I may say on this subject I hope will be an incentive to others to cause them to experiment and try to find out some of the hidden secrets which govern sound.

Sound. What is it? The answer I will leave for you as I have not seen any definition which is satisfactory to me. Tyndal says: "Sound is a jarring of the air and is a peculiar sensation caused in the organs of hearing by the vibratory motion of bodies when this motion is transmitted to the ear through an elastic medium." Thus, air, like other bodies, is simply a medium to conduct sound. There are also many solid bodies, such as steel, wood and silver which are good conductors of sound. But what sound is, I do not think any mortal man can tell us; suffice to say that we can control sound as we can control electricity, yet we cannot analyze it. We can easily satisfy ourselves that in every instance sound is caused by a vibratory motion caused by a blow or other means, thus throwing into a state of agitation or tremor the body which emits the sound. Even large and solid bodies are caused to vibrate when they produce sound, and the more solid the body, the clearer and sharper the sound will be.

Most authors, in writing on this subject, state that a solid rock or wall will reflect sound in the same manner as though a rubber-ball were thrown against it. This I have found by experiment to be incorrect. The wall, when struck by the sound-wave, vibrates and produces a new sound, thus intensifying the original sound, which was clearly proved to my mind by the experiments of Mr. A. C. Ingert in 1880, and which I have since carefully tested.

Soft or elastic walls absorb sound, leaving nothing but the original sound to reach the ear.

Almost all bodies, soft or hard, will conduct sound with more or less velocity. As air is the general conductor of sound which reaches the

ear, it is the body which we guage other substances by. There are other bodies which are agents and are capable of transmitting sound more clearly than air, water being a seven times better conductor.

Also, the intensity of sound is much augmented if its vibrations are confined in a tube or cavern of some kind, for instance, the speaking-tube, which we all so well know the value of. Thus, the cavity of the human mouth as well as the important parts of most musical instruments is a resonator, which not only improves the sounds, but to which their quality, value and character are chiefly due. Sound not only differs in character, but also in intensity, although seeming to be produced by inferior bodies; for instance, the cicada or harvest-fly, which is remarkable for the loudness of sound it emits; the organs that produce this sound consist of membranes and fibres connected with powerful muscles and situated on the under side of the abdomen, and the sound which they emit resembles the grinding of a knife on a whet-stone, and can be heard for a half mile or more.

Again, reflectors, sounding-boards and walls in close proximity to the singer or speaker augment and intensify the effect, as a mirror augments a light, and the resonance and sympathetic vibration of solid bodies is due to the reinforcement and enrichment of sound produced by instrumental sounding-boards, such as those of a pianoforte, or those of other stringed instruments, such as the violin or guitar, and of which no more striking illustration can be given than the familiar one of placing the stem of a vibrating tuning-fork against a resonating body, such as a table or a hollow wooden box.

The defects in large audience-rooms and even in small rooms are brought about by one or more of the following seeming acoustic phenomena and sometimes by all of them.

First, Dispersion. — This is where we have large and lofty buildings, such as Gothic cathedrals; the human voice is not powerful enough to fill the entire space, and the sound is left free to take the currents of air and especially the moisture, and is lost among the arches and transepts, leaving but a small portion to reach the ear of the audience.

Second, Resonance. — This is caused by the solidity of the walls, sending back different notes, coming almost simultaneously with the first note sounded, and continuing some time after, which is noticed by a ringing sound the same as the striking of a bell. This defect is very noticeable in small rooms and makes it very difficult to hear and speak in them, and the least noise is very irritating to a person who is of a nervous temperament. We notice this defect very plainly in the Allegheny Council-Chamber and especially in the Select Chamber.

Third, Echo. — This is a defect in very large rooms and is produced from the same cause as resonance — throwing back the sound from the walls. It is only noticeable in very large rooms.

We have also the acoustic defects of interference and sympathetic vibration, but these do not often interfere with the acoustics of a room.

The first defect, Dispersion, can easily be managed by means of ventilation. As I stated before, air is but a conductor of sound, and water is at least a seven times better conductor; using this knowledge, all that is necessary is to force moist air in at the apex of the ceiling and carry it to within ten or twelve feet of the floor and then take it off on all sides of the room. In this manner, we produce the same phenomenon that we observe in the open air before rain or when the dew is falling; we can then hear a sheep-bell for a half mile or more. We also notice this phenomenon in the Capitol building at Washington in two places, which are called the whispering-galleries, one at the top of the dome and the other in what was the old Representatives' room. In the latter, we find that the air is forced through the long corridors, and, as it enters this room, it is carried up against the arches, and this being cold marble, condenses the moisture in the air, forming a swirl of vapor which is held in the angle where the arch joins the ceiling, and this forms a regular speaking-tube. Persons standing in opposite corners can converse in an ordinary tone, while those standing between cannot hear even a sound. We also find the same result in the dome, produced by a similar cause.

We have many illustrations of the fact that water is a much better conductor of sound than air, such as striking two stones together under the water, or take a music-box and seal it tightly and place it under an air-receiver; by insulating the box, we find that the sound travels through the air, when if we exhaust the air the sound ceases in proportion as the air is exhausted; then if we fill the receiver with water, we find that the sound is very much increased.

Second. — Resonance is produced by a reproduction of sound in the same manner as we hear the sound in the receiver of a telephone; we know that the sound does not travel for miles on the wire, but yet we are able to hear and recognize the voices of those we know. If we take the receiver apart, we find only a magnet and a very thin diaphragm of steel and iron. As the current of electricity is sent along the wire (which is the conductor) the diaphragm of the receiver, that we hold to our ears, vibrates and produces the very sound and tone of the transmitter spoken against. We find the same phenomenon in a room; the sounds are reproduced by the walls and ceilings and are carried back through the air to our ears. All that is necessary is to form the walls and ceilings so that they will not reproduce, and this is a simple matter, as there are a great many materials that can be used for this purpose. All that is required is to form the walls with a soft or resilient surface, except those in close proximity to the speaker, which should be made hard and solid.

In regard to echo, we know that sound travels 1125 feet per second, and it follows that if a man were articulating five syllables per second, it would require a sounding-board to be placed 112½ feet distant so as to make a distinct echo. This is a serious defect in large rooms, as the clashing of sounds is very destructive to the ability of the speaker, and it is more serious to singers, as notes are introduced at the wrong time, giving rise to false combinations and discord, producing what is called wooliness of outline. This defect is caused by making hard and solid walls at the opposite ends of the room from the speaker, which should be avoided in all cases. If a hard and solid surface is formed in close proximity to the speaker, it will intensify the sound and improve the acoustics. I have built several audience-rooms in which this was clearly demonstrated and can testify from actual experience.

In regard to interference: this is where two sounds are produced in such a position that they meet on the same crest of the air-wave. This has caused Tyndal and others to make the statement that sound is the jarring of the air. For example, take two tuning-forks and hold them in certain positions and the sound of one will destroy the sound of the other, but move them slightly and you can hear the sound of both distinctly; the latter is the case when the sounds pass each other, as they meet crest to trough in the same manner as in the Duplex telegraph system, where two or more messages pass each other on the same wire.

Sympathetic vibration is caused by placing two stringed instruments in the same room, and by playing on one the strings of the other will take up the chords and reproduce them; but it is not necessary to place the instruments in the same room. We may take a piano and insulate the feet, and if we mortise a hole through the ceiling into the room above and then fit a strip of wood through this hole, running the same above the floor, and then letting it rest on top of the piano, and placing a stringed instrument on top of the stick, we can hear the tones that are produced below, and a person sitting near it, can hear the music coming from it as though some ethereal hands were playing upon it with the lightest possible touch. This very interesting experiment goes to show that either air or wood will conduct sound, and the strings are thrown into a tremor by the instrument played upon below. This is the case with all sonorous bodies, and it must be familiar to many persons that even a common hat held in the hand in the presence of loud music is thrown into a state of vibration when certain notes are produced, which vibration is distinctly sensible and causes a tremor to the hand holding it, and I may here say that anything which is capable of being thrown into vibration with sufficient rapidity to constitute a sound, may be thrown into sympathetic vibration by corresponding sounds produced with sufficient force in the neighborhood.

I think that we can safely say that all the above seeming phenomena, with the exception, perhaps, of the first, *i. e.*, dispersion, are, with respect to their acoustic influence upon a building, either decidedly useful, harmless or positively detrimental, according to the distance of the disturbing body from the source of sound, be it small or great.

In conclusion I would state that if the walls and ceilings are properly constructed in any ordinary-sized audience-room, the acoustics will be good and the rooms can be so constructed that sounds made in certain parts of the room can be heard more distinctly than if made in other parts of the room.

With regard to the size and shape of the audience-room I would say that this has but little effect on the acoustics if the walls, floor and ceiling are properly constructed and the ventilation is carefully arranged.

THE WATER-CAPACITY OF SOILS.—Herr E. Wollny has been making a long series of very exhaustive experiments, which have led him to form the following conclusions: 1. The water-capacity (measured by volumes) of a soil diminishes with a rise in temperature. The opposite is the case with peat. This diminution is relatively greater the larger the pores in the soil. 2. (*a*) The freezing of the water in soils usually causes a diminution in their water-capacity. (*b*) This latter result is merely transient in the case of soils of only a slight cohesive character — *i. e.*, coarsely granular, sandy, poor in vegetable matter. It is of a more permanent nature in the case of soils which show a tendency to form crumbs — *e. g.*, finely granular, argillaceous soils, or soils rich in vegetable matter. (*c*) The result mentioned in (*a*) is more marked the greater the quantity of water in the soil, and the more frequently (within certain limits) the frosts alternate with thaws. (*d*) In the case of crumby soils, the duration of the diminished water-holding capacity may be materially altered and even converted into an increased capacity if there are frequent alternations of frost and thaw or the crumbs are loosely aggregated, as this facilitates the breaking up of the crumbs into a finer state. An explanation of these facts is the increased or diminished aggregation of the soil, resulting from the freezing of the water in the soil. 3. (*a*) The water-holding capacity of a coarsely-granular soil is increased by the presence of even a very thin (3–5 cm.) difficultly permeable subsoil — *e. q.*, clay. The more so the nearer the latter is to the surface. The effect is more marked the greater the difference of water-capacity of the upper and lower soils. (*b*) An easily-permeated subsoil only slightly increases the water-capacity of the soil above it if the latter is of a finely-granular or argillaceous character, but diminishes its capacity if it is more coarsely granular. — *Jour. Soc. Chem. Industry.*

INTERNATIONAL RAILWAY CONGRESS AT MILAN.

LITTLE CASTERTON, RUTLAND
AFTER "THE BUILDING NEWS"

A PERMANENT and international railway commission, composed of the representatives of the various governments, railway administrations, and railway companies was formed two years ago through the initiative of the leading officials of the Belgian State Railway for the purpose of taking into consideration questions, technical, economical, and humanitarian, affecting railway working. The first Congress was held at Brussels in 1885, and the second has lately been held at Milan under the presidence of Commendatore Professore Francesco Brioschi, senator of the Italian Kingdom, and director of the Milan Technical Institute. Though the Congress was held in Italy, the discussions were carried on in French, which is still the universal language in Europe; but the various accents and intonations of Belgians, Russians, Italians and others made it very difficult to follow the proceedings. The States were represented by Mr. Ely, engineer-in-chief of the Pennsylvania Railroad, who, with Mrs. Ely, were honored guests at a dinner given by Sir Andrew Fairbairn, director of the Great Northern Railway, to British members of the Congress.

Among the subjects discussed, metal sleepers were generally approved of; mild steel was recommended for bridges with special attention to its selection, especially for large spans; the practice of letting the maintenance of permanent way by contract was condemned; snow was considered too variable a quantity in different countries for any general rule to be laid down as to its removal; good ballast, frequently renewed, with larger sleepers and stronger fish-plates than hitherto used, were recommended, together with constant and minute inspection; and it was considered preferable that a set of engines be entrusted to a gang of drivers, instead of each driver having his own engine. With respect to the construction of passenger cars, M. Banderali, of the French Northern Railway, brought up the report of Section II., recommending that wheels be perfectly balanced, and that, whether there be a double set of springs or not, some elastic substance be interposed between the body and under-frame. What could be done, he urged, in the way of deadening the effect of shocks due to the irregularities of the road was proved by the careful manner in which President Garfield, when lying sick and wounded, was conveyed a long distance to the sea-shore. The Section considered that dead weights per passenger carried, should be reduced to a minimum, additional room being charged extra, all which was endorsed by the Congress.

While steel proper was condemned for locomotive boilers, homogeneous metal was approved of, and a jet of steam or water, instead of sand, for securing the adhesion of the wheels; a mixture of vegetable and mineral oil was recommended for lubricating axles, and white-metal for the bearings; fixed and sufficiently remunerative wages should be paid to drivers, with premiums for economy so long as they do not interfere with safety and efficiency; improved connections for continuous brakes were demanded; but the latter were impossible for goods-trains so long as there was such diversity of rolling-stock; the problem of electrically lighting trains had not yet been solved, and, hitherto, enriched gas had given the best results; there was still much to be done in the warming of cars, but, at present, moveable foot-warmers were to be preferred.

Tickets or coupons should be checked and taken on the run instead of at stations; simplification in the construction and working of lines with slight traffic was enjoined; for lighting stations electricity was greatly preferred to gas; railway servants should be chosen as much as possible from the families of those so employed; and women, though physically weaker, were far more to be relied upon than men for railway work; higher wages should be paid to the lower grades of railway servants, and mechanical means used as far as possible for lightening their labor; while the general feeling was against any government tax being imposed on the transport of goods.

With respect to questions specially affecting secondary lines, it was agreed that these should be made and worked as simply as possible; continuous brakes were deemed unnecessary, as was a baggage-van between the engine and first carriages; a 10-ton car with longitudinal passage was recommended, and the abolition of a guardian at level crossings; while any attempt at unification, whereby light lines would be made into a system, was to be deprecated, as that would be construed by the railway companies as an attempt at competition, and resented accordingly.

During the Congress, the members inspected an hydraulic arrangement at Abbiategrasso, between Milan and Mortara, for working points and signals, whereby a woman can easily perform the work, or even the station-master from his office. A few hours' pumping by one man daily is sufficient to charge the accumulator, and the addition of ten per cent of glycerine to the water prevents it from freezing. This arrangement, the invention of Ingegnere Bianchi, Chief of Section for Permanent Way on the Italian Mediterranean Railway System, has passed the government inspection, is being applied to the Savona Station with sixty-five levers, and will be used henceforth at all new stations. The members also witnessed the decomposition and reforming of goods-trains at the *smestamento* (sorting) station of Porta Sempione, Milan. The trains, as they arrive, are run onto a gradient of one in one hundred, where each wagon is marked with a large figure in chalk representing the siding where the new train is to be made up. The wagons are then detached, and run down by gravity, a man giving a bugle signal, as each wagon passes, to the pointsman, to inform him what siding to turn it onto. At this station, also, is a weigh-bridge, designed by Signor Bianco, Chief of Division for Permanent Way on the Mediterranean System, the platform of which, clear of the rails, is never taken off the knife edges. When it is desired to weigh a wagon, two angle bars are brought by a system of rods and levers against the rails, and receive the flanges of the wagons.

The two leading principal railway companies of Italy, the Mediterranean and the Adriatic, which divide between them longitudinally, and in about equal shares, the working of nearly all the lines in the peninsula, have recently adopted the mechanical system of statistics devised by Cav. Bonazzi, which was specially brought before the members of the Congress, many of whom made themselves acquainted with its working. This system, which saves half the number of clerks, gives very complete information, brought up to date, about the working of a railway and the traffic. The main principle consists in taking tickets from a perforated roll of paper-tape in a receptacle, and sticking them onto another roll, wound up in a receiver, the various categories of rolling-stock being represented by certain colors, and the units, tens, hundreds, and thousands of kilometres or miles run by other colors. The system, however, is capable of constant perfection and application to individual requirements, and may be used with advantage for recording time worked at factories, births and deaths for municipalities, imports and exports, patients at hospitals, soldiers in an army, prisoners in jail, and, indeed, an endless variety of purposes.

The general meetings were held in the handsome *foyer* of the Scala, which disputes with two or three other theatres the honor of being the largest in Europe. The fact is that one is largest in one respect, and another in another. The Scala holds from 3,000 to 3,500 persons, and has so many exits that it can be cleared in eight minutes. The acoustic properties are something marvellous for so vast an interior, which has five tiers of boxes. The theatre, designed by the Architect Piermarini, was built between 1776 and 1778; and the stage was reconstructed and enlarged by Canonica in 1814; its dimensions are: depth, 37 metres = 121 feet, width 25 metres = 82 feet, and height to roof, 27.3 metres = 90 feet. The pit is 24.84 metres = 82 feet long, and 22 metres = 72 feet wide. There is ample provision for arresting any fire that may break out. The theatre is illuminated by 2,860 incandescent electric-lamps, 150 candles being also lighted every night, to provide for the possible failure of the electric plant. All the rest, except one of the Milan theatres are now lighted electrically, as under: Dal Verme, 1,650 lamps; Manzoni, 500; Filodrammatici, 350; Fossati, 300; Milanese, 120; Fiando (for children), 50. The incandescent lamps for lighting the theatres, hotels, cafés, and many of the shops, together with the arc-lights on the Thompson-Houston systems in the main thoroughfares, are maintained from a central station in the Via Santa Radegonda, at a cost rather exceeding that of gas, but with far greater efficiency.

To merely mention the city of Milan without a word about its beautiful cathedral, would be something like the play of Hamlet with the part of Hamlet left out. For a long time its foundation was ascribed to Giovanni Galeazzo Visconti in 1386; but later investigations have shown that this, the most elaborate and magnificent Gothic edifice in existence, was due entirely to the initiative of the Milanese people, and erected at their expense. It was built on the site of a chapel to Santa Maria Maggiore, which became a ruin in 1162, owing to the fall of its *campanile*, then held to be the highest in Lombardy, destroyed by order of Barbarossa. Whether the cathedral be due to Duke Visconti or the Milanese people, certain it is that the former bequeathed a quarry at Candoglia, Lago Maggiore, for exclusive use on the building, and that all the repairs, restorations, and additions are executed with this stone. This is a very compact and solid marble, not purely white, but tinged with red and yellow in places, and having blue veins in others, though the new work, and also that which has weathered, especially with the sun shining upon it, appears quite white. The low-pitched roof is covered with large and thick slabs of the same stone, the edges of the upper side and two ends having a low but wide fillet where the joints occur, which are made good by a seam of asphalte.

Whether the cathedral be due to the munificence of one individual or to the united piety of a whole people, their descendents have not shown themselves worthy of so beautiful and unique an edifice,

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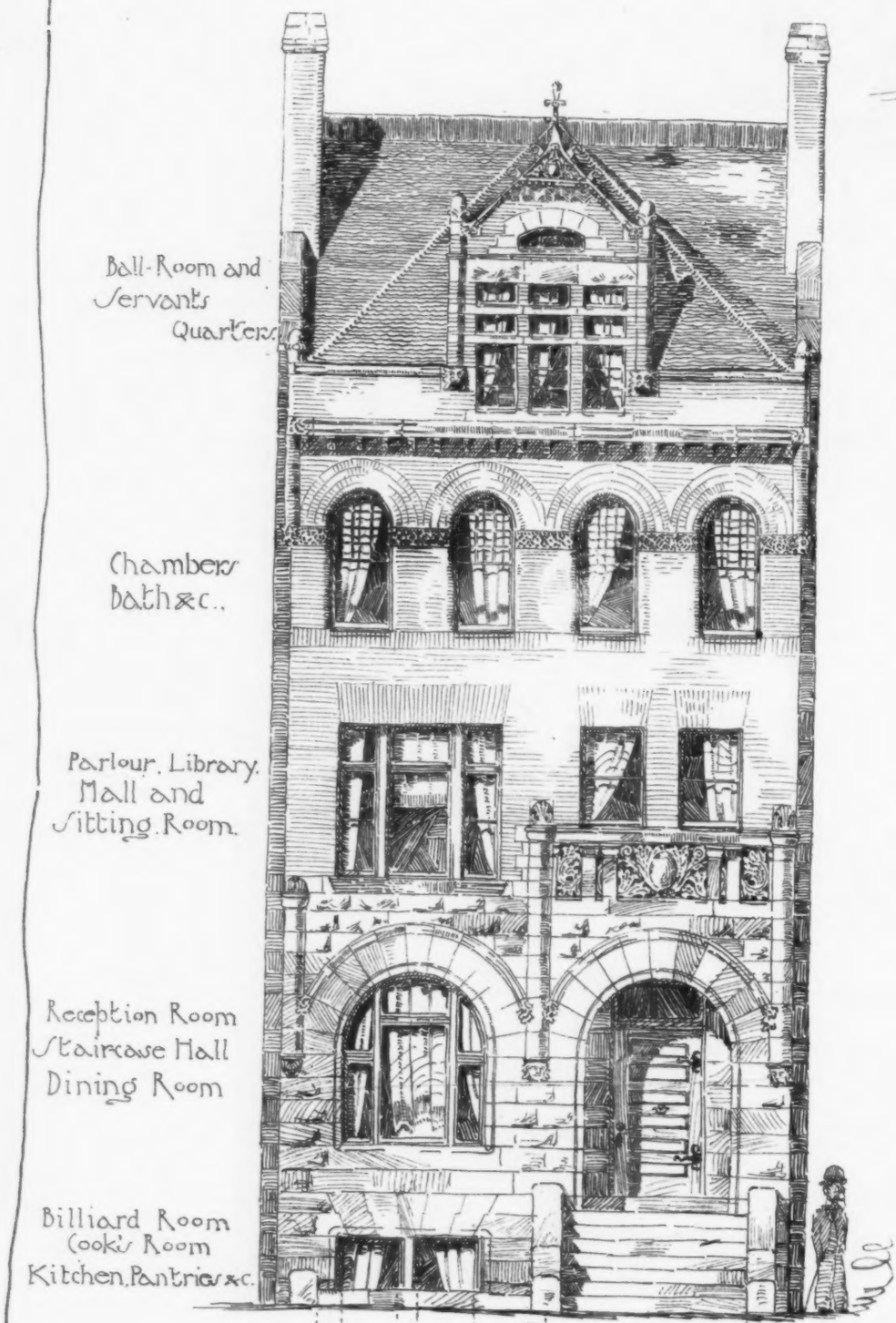
First Prize Design

Wm. J. Polk

Ol' Dat Watermelyon.


Ball-Room and Servants Quarters
Chambers Bath &c..
Parlour. Library. Hall and Sitting. Room.
Reception Room Staircase Hall Dining Room
Billiard Room Cook's Room Kitchen. Pantries &c.

K.C.A.S.C.

Competition for a City House.

Heliotype Printing Co. Boston.

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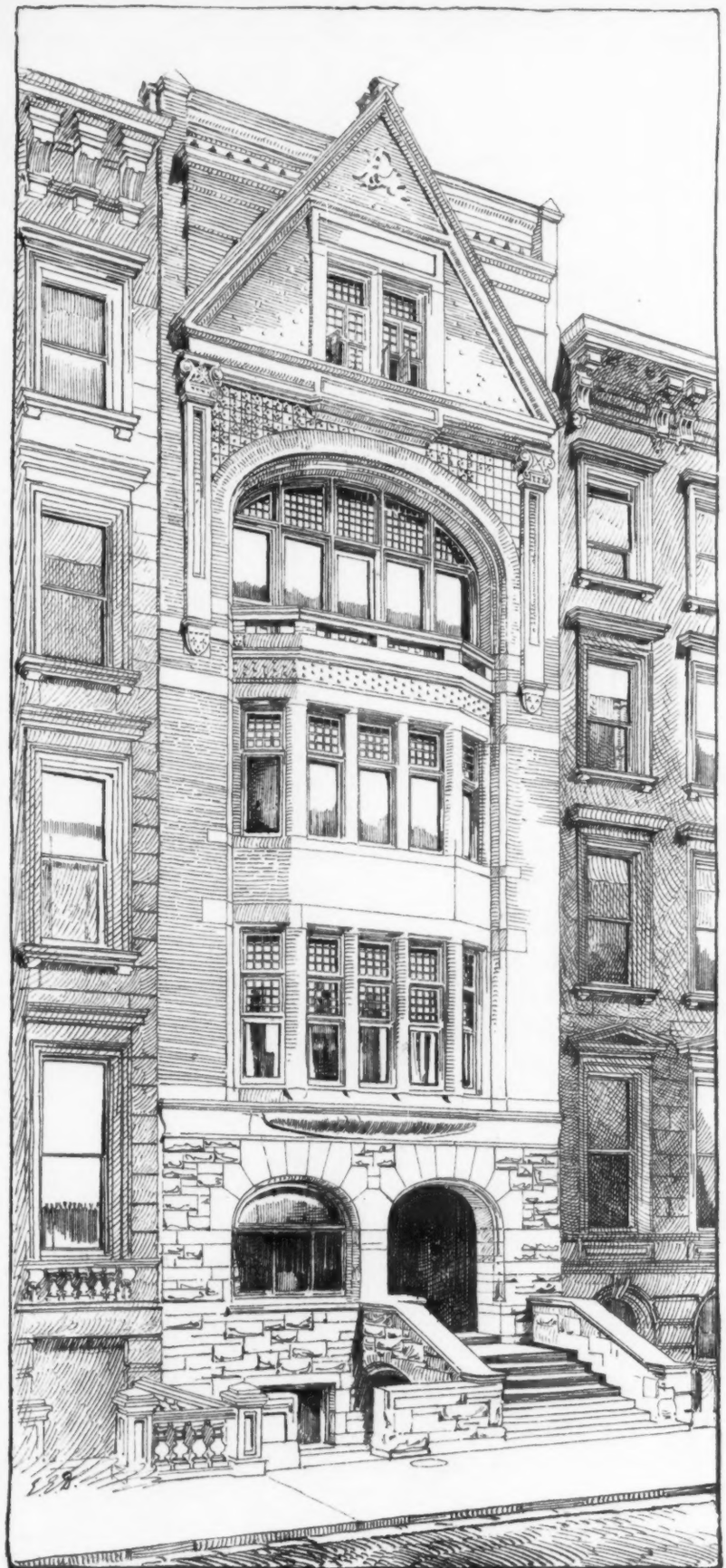
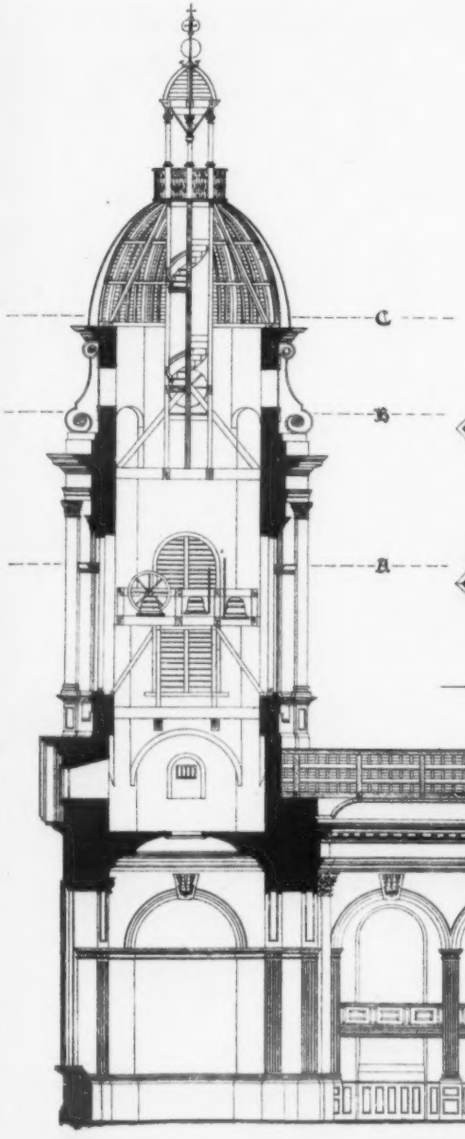


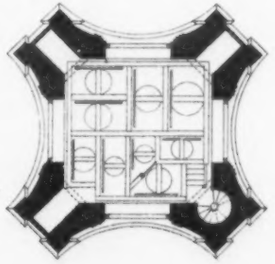
HOUSE · OF : DR · MORTON : · 35 · WEST · 56 th · STREET : NEW · YORK :

· BRUCE · PRICE · ARCHITECT · · · ·

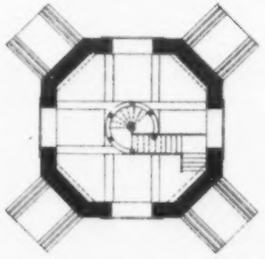
Side : Elevation

Back : Elevation.

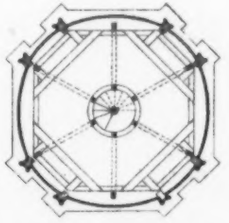




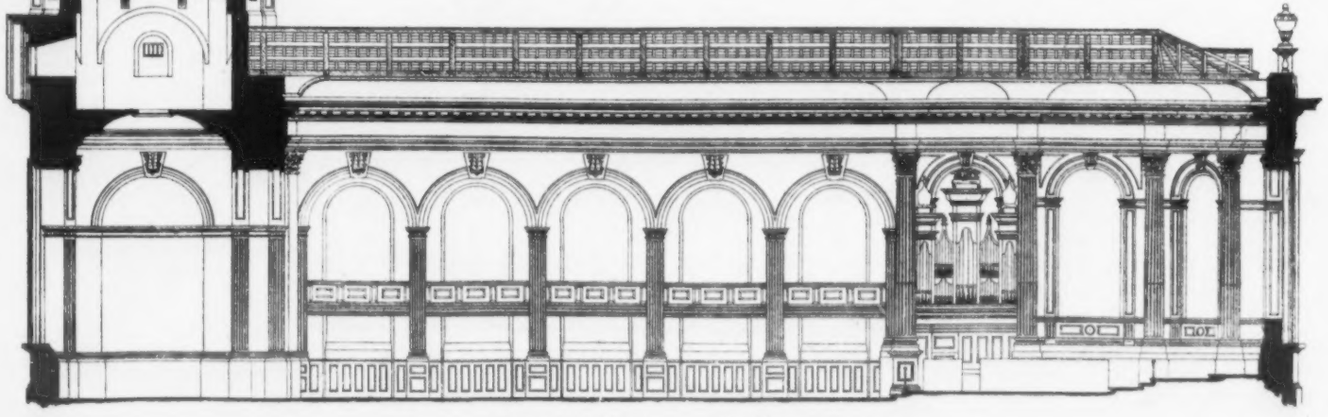
Plan at Stage-A



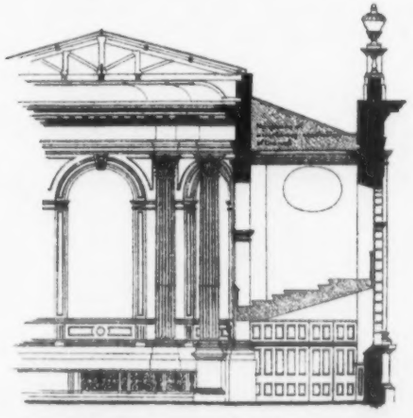
Plan at Stage-B



Plan at Stage-C



Longitudinal : Section



Transverse : Section

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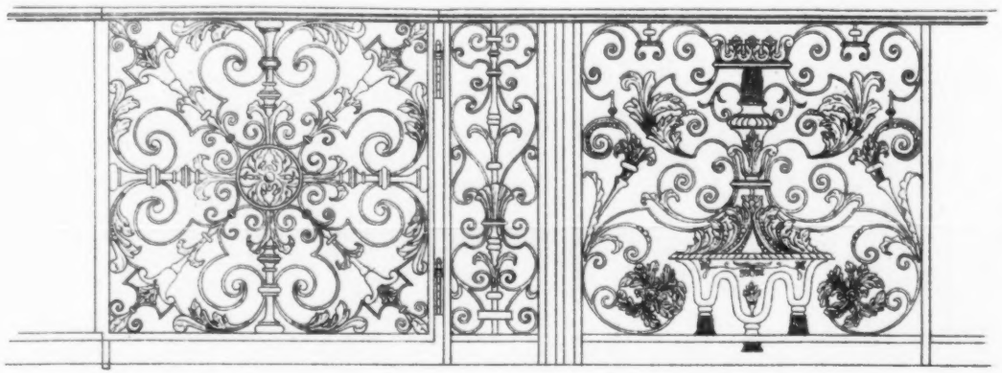
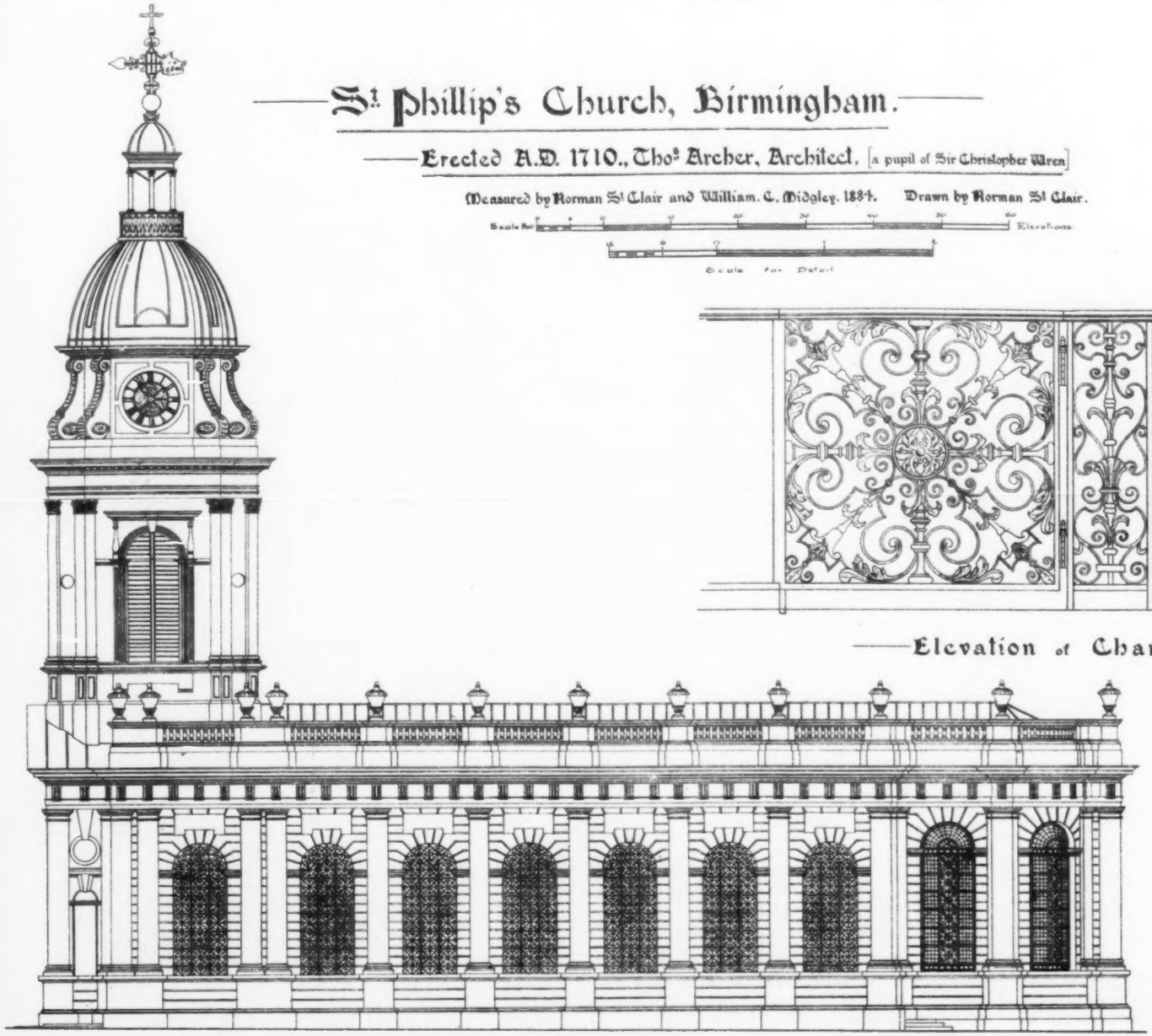
St. Phillip's Church, Birmingham.

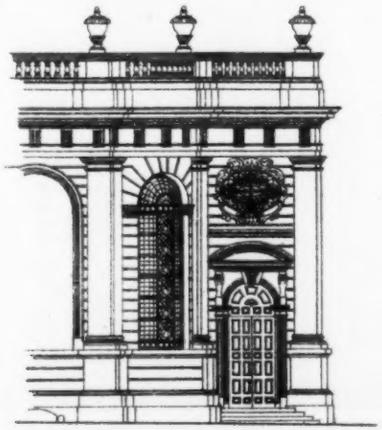
Erected A.D. 1710., Thos Archer, Architect. [a pupil of Sir Christopher Wren]

Measured by Norman St Clair and William. C. Midgley. 1884. Drawn by Norman St Clair.



Elevation of Chancel: Rail





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Summer Cottage at Kennebunkport, Me. for D. H. Bartol, Phila. Penn.

Halliday Printing Co. Boston.

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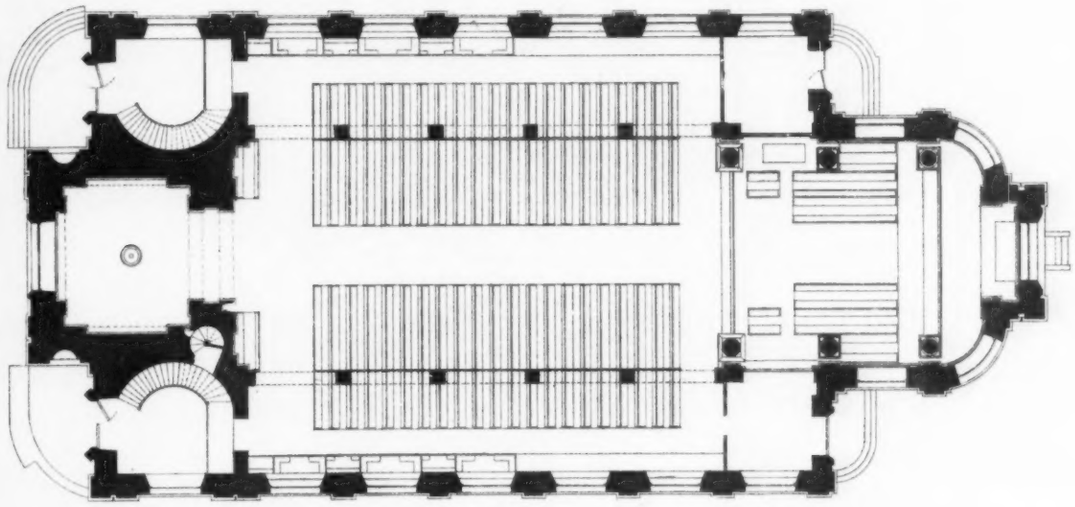
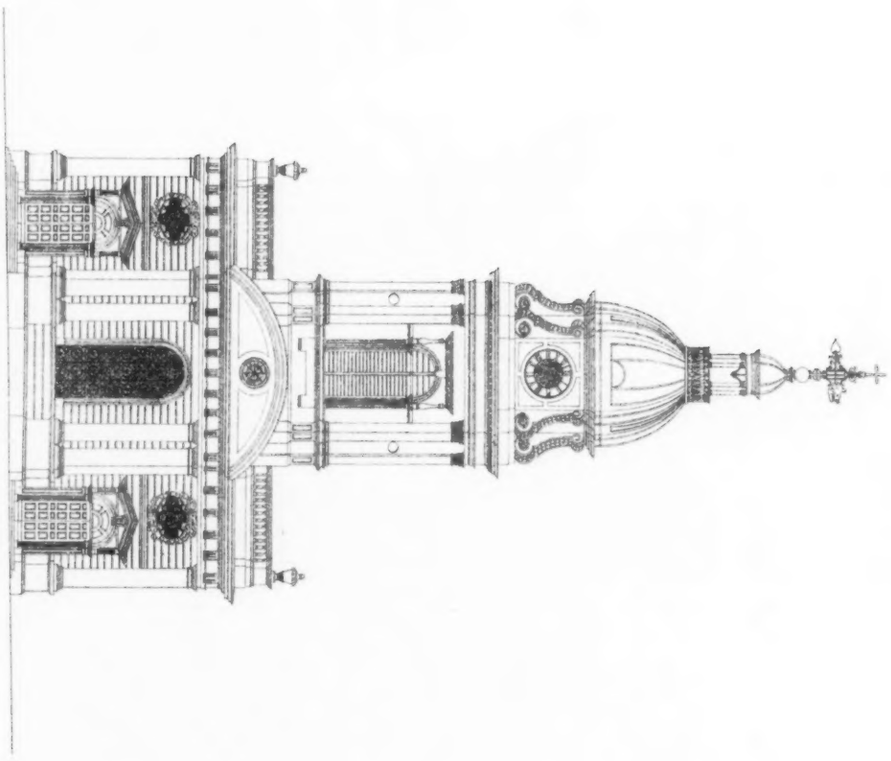


Plan



West Elevation

St. Phillip's Church, Birmingham.

Measured Drawings.

Ethelgyth Printing Co. Boston.

for they have done their best to dwarf its fair proportions. The Galeria Vittorio Emmanuele, itself a handsome structure in the Italian style, and the arcade facing it, the two flanking the Piazza del Duomo, which extends before the west front, should have been erected anywhere but in their present position, for when they form the foreground of any view including the cathedral, they simply make it look small; and it is only by remembering that each of the one hundred and twenty-two statues which terminate the pinnacles are larger than life-size, that one has a just idea of the grandeur as well as the beauty of the structure. The west front was begun in the Italian style, and continued in a later Gothic than the rest of the edifice, and the Milanese are not satisfied with it, so they have a project for reconstructing it; but it is doubtful if anything done to the cathedral can take off from the unfortunate effect of its too modern and too imposing surroundings. A far more pleasing view of the building than that obtained by looking towards the west front is that of the intersection of nave and transept seen from the Corso Vittorio Emmanuele, with a foreground of comparatively old and irregular houses in shade, and the early morning sun lighting up the statues and the ornate buttresses, which glisten as if they were made of the purest Carrara marble.

The streets of Milan are paved on one uniform model which has been found to answer very well hitherto; but now that the surface is constantly being disturbed for laying tram-rails, gas-pipes, and electric wires, trials have been made of other systems, without, however, finding anything better. Narrow streets, which are the rule in Milan, have two lines of granite flags laid on a double course of brickwork, forming a tramway for ordinary vehicles, the space between the flags being pitched with small pebbles and made slightly concave to receive the rain-water which runs off through stone gratings into the oviform sewer below. The footways are paved with granite flags, slightly inclined to let the water run off, but not raised above the surface of the roadway, and the space between the footway and the granite tramway is pitched in the same manner as that between the granite flags of the tramway. In wide streets, there are two lines of granite tramways, the space between them being convex and pitched with pebbles.

For demolitions and constructions, hoarding is carried up the total height of the building, but is only boarded as high as the ground floor, the remainder consisting of reeds or coarse sacking attached to a light framework. For cleaning and decorating the fronts of houses, openwork wooden towers, travelling on four rollers, are used, some of which have a provision for increasing or diminishing the height at pleasure. Aerial ladders are also much employed in all the public services. The *scala* Porta, which seems to be most in request, consists of a wagon carrying a series of ladders diminishing in breadth and in the thickness of the sides. The top ends of one carries sockets for receiving the lower ends of the next, and so on, a rung driven in at the joint making all tight. Short iron struts are also attached to the joints, and four rods for each ladder, two acting as hand-rails and the others as diagonal ties, solidify the aerial structure, which, when raised by a winch and double bell-crank and balanced by counterweights on sliding bars, is capable of supporting as many men as can get upon it. The greatest height yet made is 35 metres or 115 feet, and this size can be conveyed by four horses and put together by four men in five minutes.

Milan is built on the left bank of the little river Olona, which is connected by a system of canals with the Adriatic and also with Lakes Como and Maggiore, 80 metres or 262 feet above the level of the city. The difference of level is surmounted by a series of locks, which, it is said, were invented by Leonardo da Vinci, who, like Rubens, was architect and engineer as well as artist, and who has left in his city of adoption specimens of his skill in all three branches. His statue, as embellisher of the city, by P. Magni, adorns the Piazza della Scala. Though Milan, however, has not the advantage of being on a large river, it has become the commercial capital of Italy, and now numbers 350,000 inhabitants. The city has more than once extended its boundaries, and the time has now arrived for still further extension. A special department of the municipality has been appointed to carry this out systematically, with the making of new thoroughfares in the old city, special attention being bestowed on that quarter which contains the Castello, which dates from the fourteenth century, the imposing Arco della Pace, and the Arena, modelled on the Roman Amphitheatre. The figures on the frieze of the interior of the monumental entrance-gate are so skilfully painted as to appear in *alto relievo*, and it is only when the visitor looks at a part on which the light falls directly that he can be persuaded of the illusion. The future city boundary is to be a circle, obtained by a give-and-take arrangement of area with the adjoining communes or townships.

The notables of the Congress dined one night at the Monza Palace of King Humbert, who is so liberal a monarch in the van of all progress, moral and material, that he is more like the president of a republic than a crowned sovereign. Monza, the ancient Roman colony of Modicia, is now the Versailles of Lombardy, and, with easy access to Milan by railway and steam tramway, is an agreeable residential town, with numerous villas beautifully situated. The Royal Palace was erected in 1777, from designs by Piermarini, and includes a vast hall adorned by many paintings of merit. The members were officially received and very hospitably treated by the Prefect of the Province of Milan and also by the Syndic or Mayor of the city, at the Palazzo Municipale, designed by Galeazzo Alessi in the Michael-Angelesque style, and having a court-yard ornamented with considerable elegance and richness. During the Congress the members paid a visit to the Palazzo Litta, once the town-house of a noble Italian family, and now serving for the general offices of the Italian Mediterranean Railway Company. Though the movable works of art have been removed, the elaborate marble staircase still remains, a relic of former grandeur. Here is the Statistical Bureau, where the Bonazzi mechanical system, above mentioned, is worked, so that the officials can at any time feel the pulse, as it were, of the traffic.

But the *dulce* which relieved the *utile* of the Congress was not confined to the hospitable city of Milan. A special train took the members to Venice, where they had an opportunity — too short, alas! — of viewing the treasures of the Fine Art Exhibition. Another day they went to Genoa, la Superba, passing on the way the famous Certosa or Carthusian Monastery at Pavia, dating from the fourteenth century. At Genoa, they were entertained at luncheon in the Palazzo Ducale, the large hall of which is grandiose and magnificently decorated. Then, with no time to view the many objects of interest in the city of Christopher Columbus, they embarked on board the "*Umberto Primo*," a fine steamer of 1,400 tons burden, which has since got on the rocks off Ischia, and were steamed along the marvellous Riviera Orientale, where the Apennines, here coming down close to the edge of the blue Mediterranean, are studded with white villas. Eyes were strained to descry the column put up to commemorate the embarkment of Garibaldi with "the thousand" (*i mille*) for Sicily in 1859. In the evening, the members were entertained by the Syndic of Genoa at the Municipalità, where are preserved Paganini's violin and bow. The "bouquet" of the excursion was, however, reserved for the close of the Congress, in the trip to Lake Como, which was visited with the most agreeable accompaniments. The party embarked on a steamer at Lecco, lunched or rather banquetted at Bellagio, the large *salle* of the hotel which accommodated one-third of the party, being decorated in the Pompeian style, and finally landed at Como, where the whole population seemed to have turned out to greet them, and if the members did not learn the tune of the popular and spirited "Marchia Reale," it will not be through want of hearing it sufficiently repeated.

J. W. P.

ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

THE PARLIAMENT BUILDING, OTTAWA, CANADA. MESSRS. THOMAS FULLER AND CHILION JONES, ARCHITECTS.

[Gelatine Print, issued only with the Imperial Edition.]

SOME mention of this building was made in the *American Architect* for October 15.

KANSAS CITY ARCHITECTURAL SKETCH CLUB COMPETITION — A CITY FRONT BY MR. W. J. POLK.

SUBJOINED is the report of the judge: —

In judging these designs, which are so varied in character and merit, it occurred to me that the most satisfactory method of forming an opinion would be by a careful analysis of the various components of a design, and by making a judgment on the comparative points of each component; accordingly, I arranged a system by which I was able to grade the various drawings as to their merits.

1. In construction, meaning by this the obvious facility with which the design could be executed, and its fitness when so executed, keeping in mind particularly the arrangement of the piers and windows for proper distribution of loads. 2. Proportion of parts forming the composition. 3. Detail. 4. Rendering.

Nine drawings were submitted, and in each class I established a grade from one to nine, nine being the highest number of points in any class, there being four classes. Having established this system, I proceeded carefully to credit each drawing with the number of points in each class which it seemed to merit. Before making a computation of the totals, I laid aside the calculations and proceeded to form an abstract judgment without the aid of this system. Having reached a conclusion in this particular I proceeded to cast up the totals of points, when I found that in each particular the judgment by points corroborated the abstract judgment.

The following is the score:

	Construction.	Proportion.	Detail.	Rendering.	Total.
"*O' Dat Watermelyon.*"	8	9	9	9	35

From this showing you will see that the design, "Oh Dat Watermelyon," has received the highest number of points, and is, in my judgment, the most meritorious design submitted.

In closing I would say that I am much pleased and surprised at the general excellence of the designs submitted.

(Signed) FRANK M. HOWE.

HOUSE FOR DR. MORTON, NEW YORK, N. Y. MR. BRUCE PRICE, ARCHITECT, NEW YORK, N. Y.

ST. PHILIP'S CHURCH, BIRMINGHAM, ENGLAND. FROM MEASURED DRAWINGS BY MR. NORMAN ST. CLAIR.

COTTAGE FOR B. H. BARTOL, ESQ., KENNEBUNKPORT, ME. MESSRS. FASSERT & THOMPSON, ARCHITECTS, PORTLAND, ME.

THE MEDIÆVAL GRILLE.[1]—II.

(From the French of Viollet-le-Duc.)

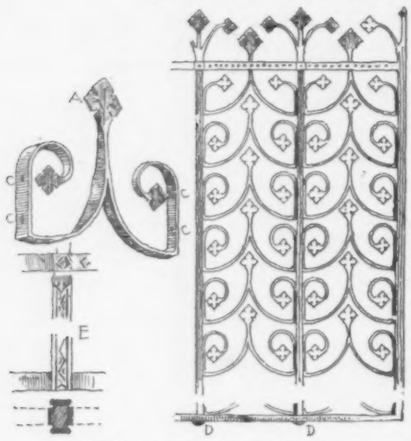


Fig. 11. Fourteenth-Century Grille.

We have seen a fragment of a fourteenth-century grille (Fig. 11) which may be said to mark the transition from stamped iron to riveted sheet-iron ornaments. Stamping was already abandoned, while the principle of upright and cross-bar construction still obtained. The ends of the scroll-irons were hammered into a lump, flattened by the hammer and then fashioned into the cut leaves. Instead of being fastened to the uprights by means of shoulders as in the thirteenth-century grilles, the scrolls were riveted laterally. The vertical bars were passed through eyes in the upper cross-bar, and riveted to the lower one. They were then covered with two thin plates of beaten iron, retouched and engraved with the burin.

This grille—from a railing, Magasins de St. Denis—was nearly a metre in height, the uprights and traverses measured 0.016m. in the broad side by 0.025m. on the edge, and the foliation 0.006m. by 0.016m. on the flat.

At the end of the fourteenth and beginning of the fifteenth century, the hammered plates were welded to the heavy irons, and it was not until later that the ornamentations was riveted on. In the cloister of the Cathedral of Puy-en-Vélay is a very cleverly forged grille, (Fig. 12) each rail of which carries an accolade welded to the uprights, the upper end of the accolade being riveted to the middle upright of the panel; the trefoils are flattened in forging, and the flower-pieces of thin iron welded to the accolades. Between the uprights are small plates of thin iron in the form of arches, which are cut out and shouldered into place. The top flowers, also of thin iron, are carefully welded to the points of the bars. The bases and capitals of the uprights and the profiles of the counterforts, or frame-bars of the panel, are fashioned with the hammer and show no file-marks.

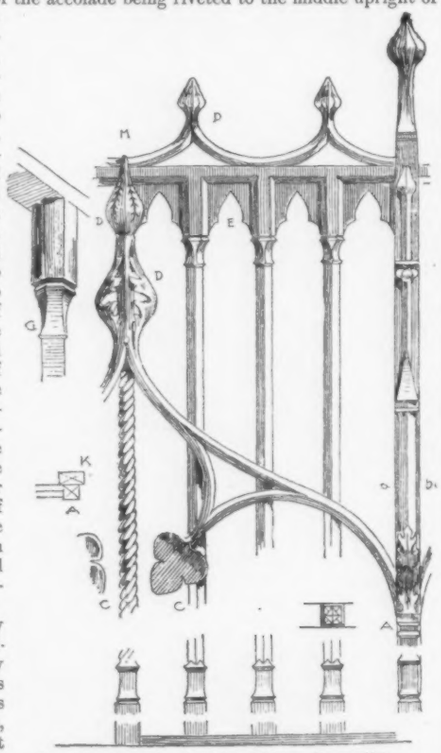


Fig. 12. From the Cathedral Cloister, Puy-en-Velay.

In the early part of the fifteenth century the uprights were sometimes set at an angle, an arrangement which permitted the fastening on, without collars or rivets, of the ornamental filling of the panels.

The Cathedral of Constance has an example of this kind (Fig. 13), in which the diagonal irons are held by grooves to the traverses set edgewise, and the flat foliations, riveted to the diagonals, are spread out into thin plates, ornamented upon the edges and of various designs.

In the cloister of the same cathedral there is a very beautiful fifteenth-century grille (Fig. 14), quite without ornament of beaten or stamped iron, the simple composition of which merits study. In this grille the counterforts support the traverses, and the uprights are passed through the traverses and set with a corner outward. Every second upright is fashioned on the upper end to receive the riveted scrolls. The alternate uprights have a tenon which is fitted into the upper cornice, passing through the scrolls.

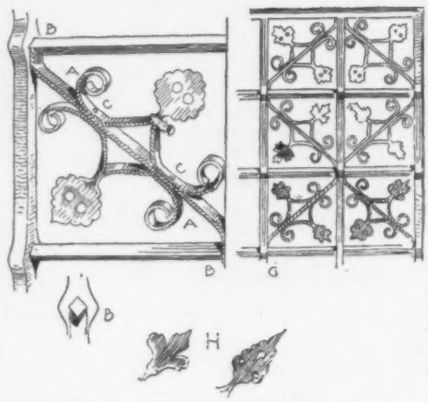


Fig. 13. From the Cathedral, Constance.

The lower ornamentation is similarly applied. The scrolls are returned up the side of the counterforts and fastened by the traverses, being riveted at the other end to chamfers fashioned on the lower ends of the lances. The uprights passing through the scrolls are fastened into the horizontal bar.

The whole is a very solid scheme of framing the scrolls, being not only riveted, but also firmly held by the tenons of the uprights.

The Mediæval grilles usually show more or less richness of workmanship in their crownings, which are ornamental prolongations of the uprights above the upper traverse. In the choir of the Cathedral of Toulouse are some fifteenth-century fan-light grilles, the crownings of which are liberally enriched (Fig. 15), in order to fill up the trilobes of a stone arch.

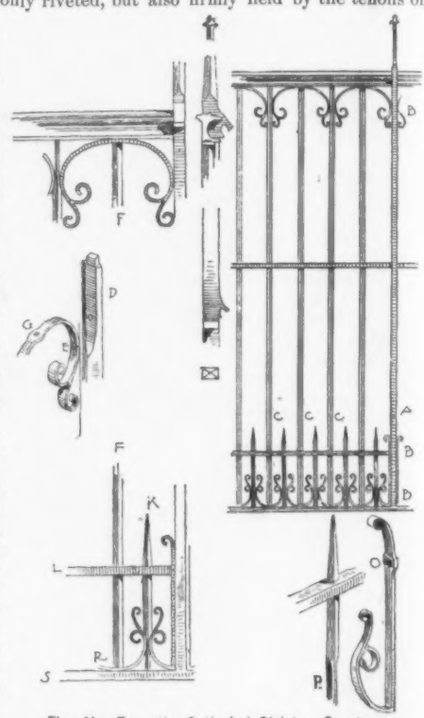


Fig. 41. From the Cathedral Cloister, Constance.

In fact, nearly all grilles belonging to Mediæval houses and châteaux display this terminal blossoming of the uprights. The window-grilles of the Château de Tarascon (Fig. 16) are arranged with uprights passed through eyes widened in the traverses with which they combine into perfect squares: the middle and two end uprights are terminated by flowers of thin flat iron welded on, the lower ends being sharpened into keen points, and both uprights and traverses otherwise have squared elbows and are fastened into the stone.

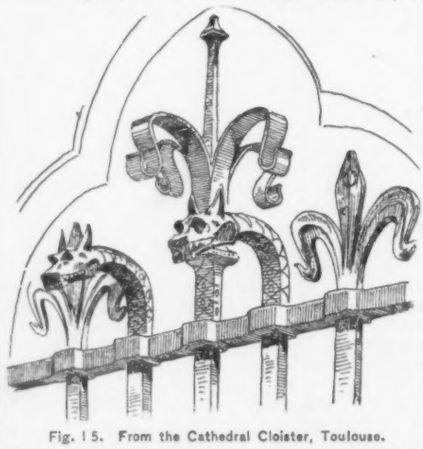


Fig. 15. From the Cathedral Cloister, Toulouse.

The uprights were often richly wrought into ornamentation both at top and bottom, with spikes and spines (Fig. 17); especially were these of use in the openings of châteaux, and were evidently designed to guard against the treacherous entry of an enemy by the windows. Fastened deep into the stonework with lead, the bars could only be pulled out after long effort and great exertion of force.

[1] Continued from No. 624, page 280.

Precautionary measures were carried so far as to suggest the framing of the uprights through the traverses and the traverses through the uprights, by means of eyes worked alternately in each (Fig. 18), so that the iron could not be slipped apart.

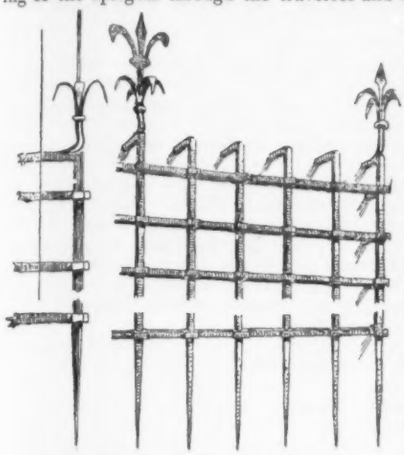


Fig. 16. From the Chateau de Tarascon.

Only the most skilful smiths could fashion such a grille, for each enlarged eye was forged as the traverses and uprights were framed, and the grille, in a word, forged entire, each mesh being put into the fire a number of times. In fact, the workmen of that time amused themselves with difficulties which are to us insurmountable.

An example of the kind described is found in a house in Constance, and others may be found at Troyes, Strasbourg, and in many places of the North and East, dating from the fourteenth, fifteenth and sixteenth centuries.

Certain grilles belonging to houses of the fifteenth century on the banks of the Garonne although well put together could not be compared in workmanship to the ironwork of the Ile-de-France, of Picardy or of Flanders.

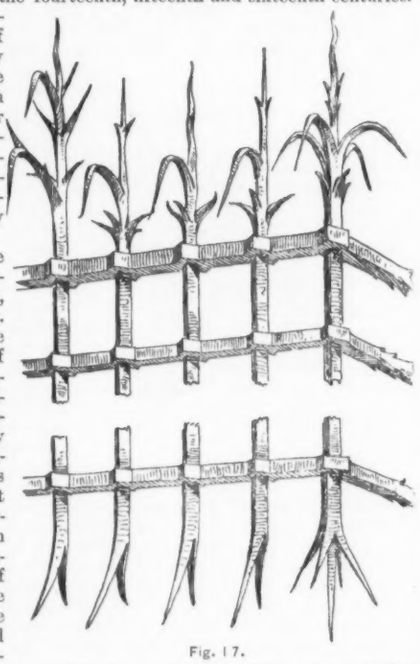


Fig. 17.

And in the Church of St. Sernin, at Toulouse, there is a grille (Fig. 19), enclosing the choir on the right of the piers of the transept, which, although well designed, is very coarse in workmanship. The uprights are roughly wrought of squared iron terminating in beaten and welded crownings, while friezes of sheet-iron mask the traverses, these friezes being edged with a little crenellation and held by rivets passing above and below the traverses, so that they are quite independent of the structure and are solely ornamental.

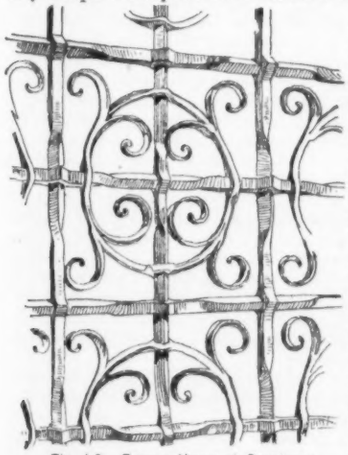


Fig. 18. From a House at Constance.

These grilles which date from the end of the fifteenth century are the first instances of applied and riveted sheet-iron taking the place of beaten and welded plates. Such simplified construction made possible a richer decoration, but tended little by little to kill out the school of smiths which had flourished so brilliantly during a part of the twelfth and the whole of the thirteenth century.

Meanwhile, in the Northeast the greatness of the school was not so soon extinguished, and the ironmongery of the fifteenth and sixteenth centuries on the Rhine, in Flanders, in Switzerland, and Bavaria, is, as work of the forge, of perfect execution.

The name of the smith who forged the grilles of the tomb of Maximilian, at Insbruck, is forgotten, but his work is still superior to anything of its kind.

At the end of the fifteenth and the beginning of the sixteenth century a number of grilles of a curious pattern, were made in which the panel is formed entirely of a single thread of round iron, 0.012m., folding forward and backward, and entwining itself into many folds. With great difficulty, and the burning of many bars of iron, this grille (Fig. 20) has been reproduced for me by some of the best workmen of today.

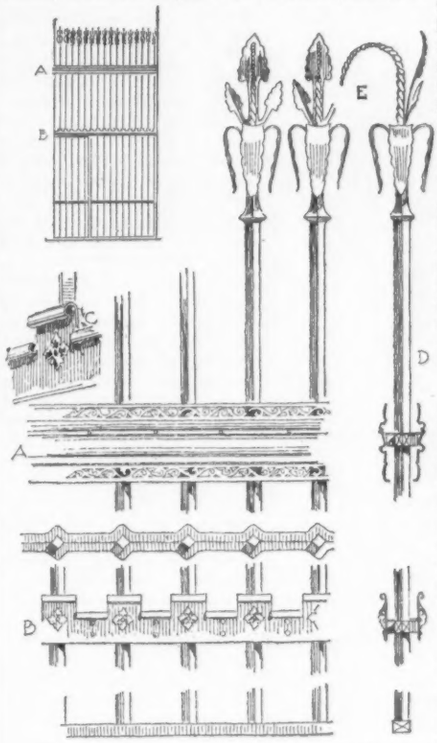


Fig. 19. From the Church of St. Sernin, Toulouse.

It was common enough in the fifteenth and sixteenth centuries to lead to the inference that its manufacture was not then of such difficulty. This grille was remarkable at once for lightness and solidity.

Our grilles, on the contrary, despite the extraordinary weight given them, have no solidity, and this because of those tenons and pins which go to make up a kind of ironwork which may best be likened to carpentry.

To have put together ironwork with mortises and tenons and pins would have seemed an enormity to the smiths of the Middle Ages and of the Renaissance.

Such methods, proper to joinery, do not accord with the nature of iron and with the dimensions which should be given to the parts of a grille.

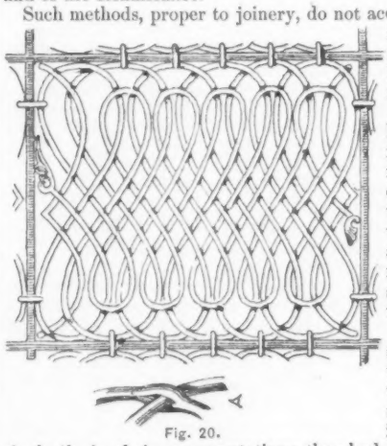


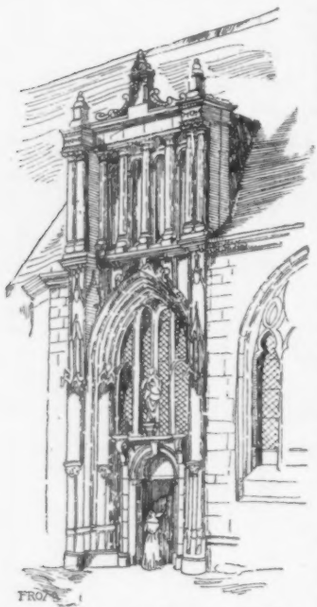
Fig. 20.

In a word, we no longer weld iron, we frame it. While the manufacture has wonderfully and vastly developed in our times, workmanship, in iron at least, has wofully retrograded from the standard of some centuries ago.

Beautiful grilles were still made in France in the fifteenth and sixteenth centuries, but riveted repoussée sheet-iron played the principal rôle in their ornamentation: they had lost the old method of welding so skilfully wrought by the guilds of smiths of the old days.

THE WORLD'S MOTIVE FORCE. — The Bureau of Statistics in Berlin has recently issued some interesting information in connection with this subject. It appears that four-fifths of the engines now working in the world have been constructed during the last twenty-five years. France owns 49,590 stationary or locomotive boilers, 7,000 locomotives, and 1,850 boats' boilers; Germany has 59,000 boilers, 10,000 locomotive and 1,700 ships' boilers; Austria, 12,000 boilers and 2,800 locomotives. The force equivalent to the working steam-engines represents: in the United States 7,500,000 horse-power, in England 7,000,000 horse-power, in Germany 4,500,000, in France 3,000,000, and in Austria 1,500,000. In these figures is not included the motive power of the locomotives, whose number in all the world amounts to 105,000, representing a total of 3,000,000 horse-power. Adding this amount to the other powers, we obtain the total of 46,000,000 horse-power. A steam horse-power is equal to three actual horses' power, and a living horse is equal to seven men. The steam-engines of the world represent, therefore, approximately, the work of 1,000,000,000 men, or more than double the working population of the earth, whose total population amounts to 1,455,923,000 inhabitants. Steam has accordingly, trebled man's working power, enabling him to economize his physical strength while attending to his intellectual development. — *London Standard.*

THE COMPETITION FOR LICK MEMORIAL, SAN FRANCISCO, CALIFORNIA.



EGLISE NOTRE DAME DE BOURGES.

THIS is usual in ninety-nine of a hundred cases the majority of the designs submitted in this competition fail to comply with the terms of the invitation sent out to those desirous of competing, and the result is twenty-three designs, most of which are not suited for the purpose, and, with one exception, none worthy of the location. The site is one seldom found in our cities, being a plat about seventy-five by two hundred feet, having streets on all four sides and the new City-Hall as a background, so that the group should be designed to be seen from all points.

With the site, the sum ($100,000), and last, but not least, the subjects to be represented, namely, the three decades in the history of the State: discovery and settlement; from then to advent of agriculture as the great industry of the State; lastly, the period of general industries up to the date 1874.

Certainly with the romance attaching to the first period, the wonderful diversity of products of the second, and numerous historical events of the third, one would look for some striking work from our best artists, instead of which we have not one strong, simple design.

Why is it designers cannot emulate the example of our best musical composers, taking a theme which being quiet and dignified in the few notes, with its variations, makes a sonata or fugue, or, light and graceful, a symphony or ronda movement, but always keeping the theme uppermost; instead of this we find an outline all lost in a maze of columns, heads, wreaths, panels and figures, and the central main object completely lost in the ornamentation.

Is it not possible that the mistake we American architects make is in not keeping to some one good style, Classic, Renaissance, Gothic, or whatever it may be, carefully considering what one's strongest leaning may be, and working out our own salvation in that order, irrespective of our neighbors. Certainly we should get purer work, and by the contrast of different orders obtain quite as much variety as at the present time, with a new departure about every five years.

But to return to the designs, in brief, they are as follows:

No. 1. An oblong mass of masonry, with rounded ends, rising above which is an octagonal structure surmounted by a group of dancing horses, though why the annals of the State should be so represented we know not; the design, in general, is original.

No. 2. Is of no particular merit.

No. 3. For a less important commission this would be very acceptable, being a rough boulder on which is the figure of Eureka and bear (the State insignia), and surrounded by figures representing different epochs. If these figures were grouped close to the boulder, the effect would be restful and the *tout ensemble* more dignified.

No. 4. Has no particular merit.

No. 5. Is evidently the work of an architect, being an octagonal Gothic structure with recessed panels, leaving the figures to represent the requirements and having a large finial for completion; the whole design is too labored and funereal — better suited for a cemetery.

Nos. 6, 7. Are of no merit.

No. 8. Has actually filled the terms of the invitation literally, by submitting three groups of figures, one to be slightly elevated. These groups are by far the most artistic of all the designs submitted; the figures are all easy and graceful, well brought together, and by taking a central object, such as a plain mass of any material, surmounted by a figure symbolical of the State, and placing the three groups about it, the result would be very strong and all that could be wished.

No. 9. Is very Frenchy in design, being a column and cap, a figure symbolical of the State, and a base surrounded by figures. Had the designer stopped here the effect would have been good, but he must needs add a platform with more figures, which simply by their superfluity weaken the whole design.

No. 10. Of no merit.

No. 11. Is, without doubt, the cleanest design of all submitted, having dignity, ease and purity. The base is square, having four arms, on which are the groups of figures, and rising some hundred feet a perfectly plain obelisk. One studies and studies this design, all the while wondering why it attracts so much, and it is simply the modesty and the feeling of strength that shows how satisfactory and pleasing a well-designed piece of work is.

Nos. 12, 13, 14. Are poor.

No. 15. Is, at a glance, the work of a modeller who has tried to do too much, and the result is a large collection of figures, panels and wreaths.

Nos. 16, 17. Of no particular merit.

No. 18. Low, square form, with panels, figures in bas-relief: neat and simple.

No. 19. Tall shaft, six-sided base, with six intermediate arms, on all of which are overdone and jumbled figures.

No. 20a. Is a large round shaft, and groups on pedestal, — not attractive.

No. 20b. This design is beautifully drawn, well studied, and, with exception of No. 11, the best submitted. The base is an oblong form, with a low central mass, having above a symbolical group, and on either side of the pedestal a group; the whole being very classical, neat and dignified. Had there been four arms to the pedestal, instead of two, the effect would be better, as the site is equally favorable from any point, and two groups necessarily are seen sideways.

No. 21. Is a lookout-tower of poor design.

No. 22. Is a short, heavy column and cap, supporting a figure, and having a circular base with three groups. The design in general is neat, but lacks strength.

No. 23. Proposes to cover the entire plat with figures, panels, groups, etc., with a central cemetery monument, with an angel on an eagle's back on one face, and California on top, with outstretched arm, holding a horseshoe; probably half a million dollars would complete it.

It has been suggested by a very few that all the designs be rejected, and that the five authors of the most worthy be invited to submit new designs (this will hardly be done); or, better, yet, if the Lick Trustees would call in some well-known artist or sculptor, and employ him outright, San Francisco might have something else to be proud of besides its miserable streets and the ruins of its *new* City-Hall.

S.

IMPURITY OF THE AIR.[1]

CAPITAL, VENETIAN.

HOW to prevent the air being tainted by the seeds of disease, especially infectious disease, and how to remove such seeds from the air, are in some respects simpler questions than how to ventilate. At least they are more circumscribed. It is not now believed, as it once was, that epidemics travel very long distances by means of air. When plague or cholera spreads from one country to another it is conveyed by infected persons or bales of goods, not by currents of infected air. The seeds of disease as they occur in the air are generally attached to portions of skin, mucous or diseased tissue, and do not travel far or maintain their vitality long in the air. The problem, therefore, for all practical purposes resolves itself into, How to manage the infected sick so as to prevent the spread of infection? Instructions in this respect, to be of much service, would require to be drawn up with reference to each specific disease. The following general directions will, however, indicate the main points to be observed.

1. In preparing a room for the reception of an infectious patient, it should be cleared of all furniture but that absolutely required, and the floor should be cleansed and left bare.

2. The room or rooms used by the patient should be regarded as infected and cut off from the rest of the house by means of a sheet or sheets (wrung out with a disinfectant solution and kept moist therewith) suspended outside each door and reaching to the floor.

3. Everything brought into the room — as dishes, glasses, books, toys — should be regarded as infected, and nothing that cannot be readily rinsed or soaked in a disinfectant solution should be removed from the room.

4. Towels, pocket-handkerchiefs, soiled linen, etc., should be boiled in a disinfectant solution. One made from sulphate of zinc and common salt is efficient and does not stain.

5. The patient should be washed daily with a simple disinfectant and soap and water. In scarlatina, after washing, the skin may be anointed with oil.

6. There should be a good open fire in the infected room summer and winter, and, if no special ventilation be provided, the window should always be left a little open.

7. Dogs and cats and domestic pets should be rigidly excluded from the sick room, as they may readily carry the infection to the external air.

8. If the patient die, the body should be at once swathed in cloths wrung out in a disinfectant solution and should be sealed in a metal coffin before being removed from the room.

9. When the room is no longer required by the patient, the doors

[1] From a lecture by Francis Vacher, F. R. C. S., published in the *Sanitary Record*.

and windows should be carefully pasted up, and the room and its contents disinfected with the fumes of burning sulphur for twenty-four hours. The room and contents should then be left to air for a week, the windows being opened and a fire in the grate. The room and contents should then be thoroughly washed. Books and toys which cannot be washed, etc., should be burnt.

A word in conclusion as to the amount of air which should be delivered to an infected patient. With a large fire in the sick-room there is no need to be afraid of supplying air too freely. I have said that 3,000 cubic feet per hour has been fixed as the amount required for a healthy adult; it is obvious a sick adult should have more than this. At the new Hôtel Dieu in Paris which I visited, 3,500 cubic feet per head per hour are delivered, and the wards are certainly not free from the ordinary hospital odor. According to Dr. Sutherland, 4,500 cubic feet should be allowed in an ordinary or surgical hospital where there are many bad cases. For an infectious patient, it appears to me reasonable to try and obtain 6,000 cubic feet per hour. To get this amount without draught, when no special mechanical contrivance is available, the capacity of the sick-room should be about 2,000 cubic feet — the air-space now officially required per head in infectious wards.

COMMUNICATIONS.

THE PROPORTIONS OF CHIMNEY FLUES.

SANFORD, FLA., Dec. 9, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Is there any authorative work published that will give proper proportions of flues for open fireplaces, furnaces, boilers, etc., if so, will you kindly advise me, name, publisher, etc., and oblige, Yours very truly, WILLIAM T. COTTER.

[*"The Open Fireplace in all Ages"* by J. P. Putnam. Ticknor & Co., publishers. *"Tall Chimney Construction"* by R. M. and F. J. Bancroft. John Calvert, publisher, Manchester, Eng. — EDS. AMERICAN ARCHITECT.]

ADVICE TO STUDENTS.

MINNEAPOLIS, Dec. 8, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — As you are interested in the welfare of young architects and as I feel confidence in your peculiar position to advise me in the matter of this note I have taken the liberty to make it purely a letter of inquiry. I have just entered the office in the position of a student. The state of my finances not warranting a course at a technical school I have sought to gain such a knowledge of the occupation of my choice as may be found in office practice, in real life. Now what I feel most keenly is the need of *directed, profitable, individual* work outside of that which I am required to do as assistant in the office, namely, tracing, copying specifications and the like. At the schools, the instruction is mainly through lectures which I cannot get. It is begun, I believe, by attacking the orders. Now what is this for? Its aim? Its end? I find my employer has forgotten nearly all of that drill — can not make a column extempore. What should be my *practice* in this direction and degree of proficiency? Then what is the next branch considered essential, and which I should try to master. I — as brother students must, also — deplore the fact that we can obtain no hand-book, manual or *"vade mecum"* for students. I earnestly desire that you will be prompted to consider the cause of office students and aid us with your knowledge and experience. Another matter of importance is the fact that no person can attend a course at an architectural school without passing an entrance-examination embracing studies which he has dropped, for sterner duties long ago. Is this not the case? If in a year or so I should see my way to attend school, how am I to get admission. Is this just to a faithful earnest seeker for that improvement which is offered and advertised by the institutions? Awaiting your reply with interest, I am, Most truly yours,

RICHARD H. KEEP.

[THE greater part of our correspondent's questions can be answered by referring him to a series of papers on "Architectural Students" by the original editor of this journal, published in this journal between September, 1876, and March, 1877. Bound copies can probably be found at the public library. As to the examination question, while it has disadvantages for the student, it has serious advantages for the school. Originally, the Massachusetts Institute of Technology received "special" students in architecture without examination, but it was found that with the serious-minded workers came a great number of lazy and indifferent pupils to whom the fact that no examination was to be passed was the all-important factor in deciding them to honor the school with their rather burdensome presence. — EDS. AMERICAN ARCHITECT.]

MR. VAUX AND THE NEW YORK PARKS.

BROOKLINE, Dec. 10, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — In a paper of your issue of Dec. 3d, an impression appears that Mr. Vaux's part in the design of the large parks of New York and Brooklyn was in some degree a secondary one. Its origin may be found in the circumstance that before the plan of the first of these parks was begun to be devised Mr. Vaux's associate in the designing of it had been elected to the office of superintendent of the park. The responsibility of superintendence remaining with him individually after the adoption of the plan, as the park came to be an institution of general interest, his name was brought more familiarly before the public. The notion that his was the leading mind in the design of the work followed naturally but unjustly.

O.

NOTES AND CLIPPINGS.

A LARGE TIMBER RAFT. — The great raft was successfully launched at Two Rivers at noon, November 15, and now lies at anchor in the bay awaiting the arrival from Halifax of the steamship *"Miranda,"* which has been chartered to tow the monster to New York. James D. Leary, of New York, who is agent for Daniel J. Leary, owner of the raft, arrived on the scene this morning. The raft is 585 feet long, 62 feet wide, and 37 feet deep, and weighs 9,000 tons. There were four ways 1,200 feet long, and the raft went slowly at first; but, gathering speed, ran 1,000 feet until she floated. She made the run in 34 seconds without the slightest strain, did not part a single chain, nor spring the vast structure an inch. She was taken in tow by the tug Neptune, and the cradle removed. The raft draws 19 1-2 feet, or 6 feet less than was expected. The launch was made under the superintendence of H. R. Robertson and Martin Hawkins, of New York, foreman for Mr. Leary. Leary and Robertson are sole owners for the patent. It was in 1883 that Hugh R. Robertson, of this city, conceived the idea of building a raft somewhat in the form of a ship, composed of logs cut in full lengths and firmly secured by chains. In the following year Mr Robertson drew a plan of the proposed raft and patented it in the United States, Canada, Great Britain, Norway, and Sweden. Early in 1885 Mr. Robertson visited New York and contracted with Wilson Godfrey for the construction of a raft afloat on the shore of the Bay of Fundy. In November of the same year, B. B. Burnhill, of Two Rivers, Nova Scotia, contracted to furnish the lumber required for the raft, and to build it ready for launching, according to plans and specifications prepared by Mr. Robertson, a change having taken place in that gentleman's relationship with his employer. Mr. Burnhill began to prepare a place for the raft near the head of the bay — a place called "Finger Board," about six miles down the bay from the Joggins and about three from Shulee. The spot was admirably adapted for the purpose, and soon workmen were engaged in the construction of the raft. The raft was completed in August, 1886, and was almost as large as the Great Eastern, and full a third heavier. It contained over 2,000,000 feet of lumber, being over 400 feet in length, 50 in width at the centre, and 33 in depth and 25 in diameter at either end. On the 31st of July, 1886, the first attempt was made to launch the raft, but it did not move. A second attempt was made the following day, and the large mass ran down the ways nearly 200 feet. There it remained owing to the breaking of the ways. Several other attempts were made to launch the raft, but without success. Then Mr. Robertson, who felt satisfied of the practicability of the scheme, decided to tear it apart and rebuild it. This was done, and the new raft was finished a few days since. It is much larger than the first structure, being over 500 feet in length, and containing about 3,000,000 feet of timber. Its general form resembles that of a fat cigar, somewhat flattened at its upper and lower sides, with the pointed end cut off. It is one solid mass with the exception of moveable interstices necessary in the packing of round lumber, in trees cut as long as they grow, from 30 to nearly 100 feet in length. The timber has been stowed with its small ends generally toward the ends of the raft, which helps to give the proper taper, and it is so interlapped that great strength is attained to hinder the structure breaking in two. The patentable point in this system of rafting is the adjustment of the chains which bind the whole together. The main or centre chain runs from one end of the raft to the other, and it is by that the structure is to be towed. The lateral chains are used to prevent the raft from working apart longitudinally by the action of the waves. The encircling chains are attached to the lateral chains, and are to prevent the raft from flattening out while afloat.

The raft is now afloat, and if it can be towed to New York, possibilities will be shown in the lumber business never heretofore dreamed of. The tug Neptune, of this port, is at the place now watching the raft, which is anchored. — *Halifax Paper.*

THE MEXICAN SULPHUR MINES. — A letter from Mexico to the Brooklyn *Times* says of the production of sulphur: "In view of the value of sulphur deposits of Popocatepetl, it seems incredible that they have not been more thoroughly worked. At present Sicily is the principal source of the world's sulphur supply, that country producing more than four-fifths of all that is consumed on the globe. The deposits of "old Popo" are much greater than that of Sicily and of better quality, and can be brought to market — at least in the United States — twenty-five per cent cheaper than the Sicilian. Aside from that consumed in Mexico more than 200,000 tons are annually used in the United States, and even if every ton of Popocatepetl sulphur were sold at twenty per cent below the usual price, there would still be a clear profit—after allowing for freightage and all other expenses, of not less than two dollars per ton. The expenses of production are very small. The workmen receive seventy-five cents per arreba (25 pounds) for bringing up crude sulphur from the interior of the mountain and delivering it at Flamacas. This work is exceedingly laborious and full of danger; not only are huge rocks constantly rolling down the sides of the crater, threatening to engulf the tiny windlass and crush the atom of humanity being lowered into the depths by a frail rope, but the sulphurous vapors and exhalations are extremely injurious to the health. The workmen remain in the crater a month at a time, eating and sleeping in that inferno, after which they are hauled up and their places supplied by others. It is

said that in a short time their teeth fall out and their hair drops off their heads like bristles from a scalded pig, and the man who goes down in the stoutest of oxhide boots and the stoutest of new clothes, comes up at the end of the month in the dilapidated condition of Rip Van Winkle after his twenty years' nap.

The Schloss of Fredensborg. — "The Schloss of Fredensborg is one of those huge barracks which Continental sovereigns were fond of erecting till the middle of the last century, when the French style became universal in Europe," says the London *World*. "It contains nearly four hundred apartments. There is an immense hall, and also a great room called the dome hall, which has usually been the dining-room during the last three months. The library and saloon are fine rooms, but the rest of the palace is divided into suites. The Emperor and Empress of Russia had five rooms facing the park, of which one, used as a study, contains a large painting of Catherine II. The Princess of Wales had a charming suite of three rooms, the *salon* entirely furnished with walnut. The Queen's apartments, which are splendidly furnished in the style of the last century, were the usual sitting-rooms in the morning and after dinner. The whole palace was crowded, what with royalties' suites and servants, and the Crown Prince and Princess occupied a house in the gardens. The rooms are plainly, and, indeed, barely furnished, and the palace is evidently intended only as a summer residence."

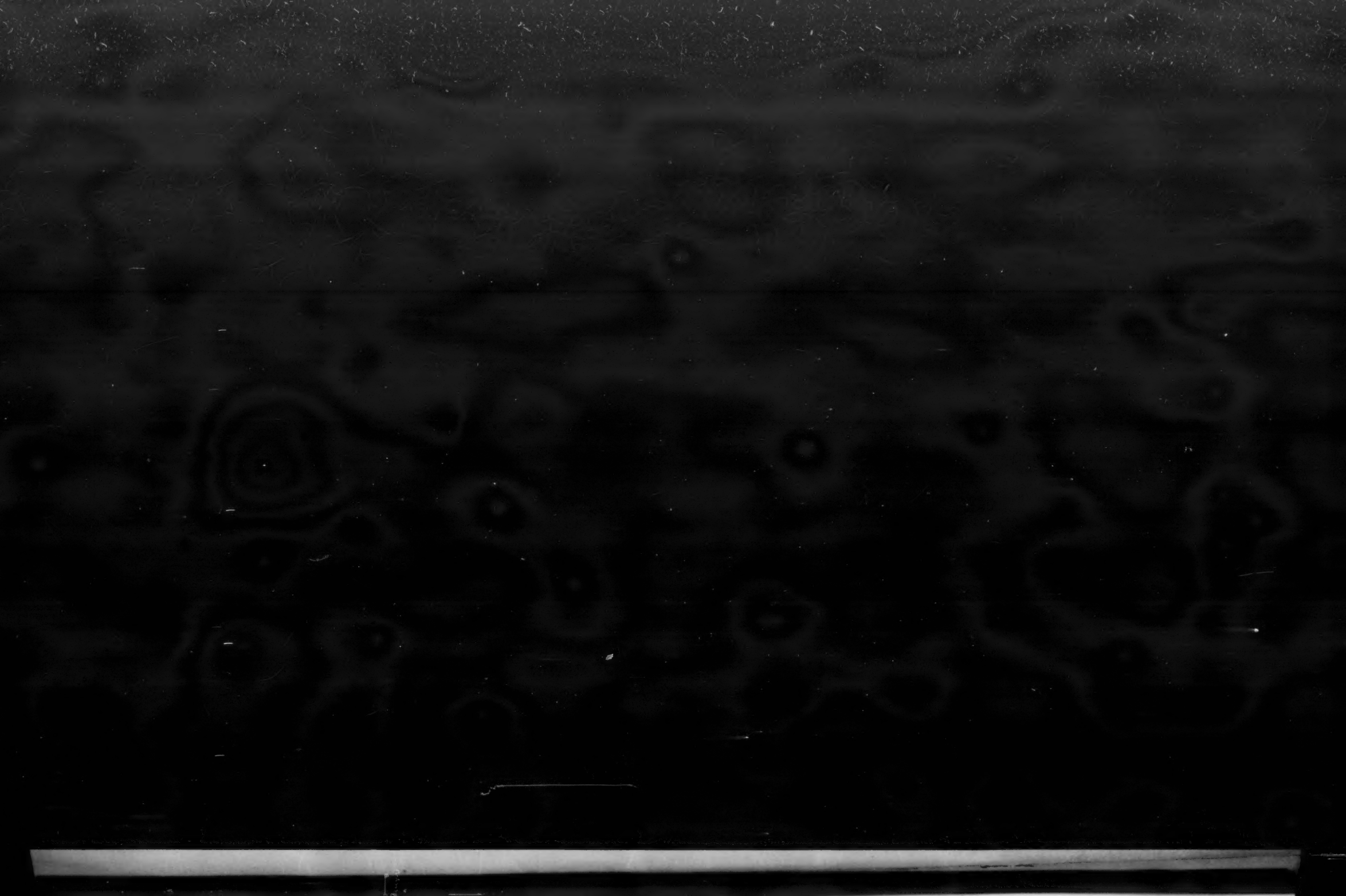
What a London Fog Costs. — "The cost of a single day of fog to the gas-consumers of London may be gathered from figures compiled from official sources," says the London *Standard*. "Wednesday was a day of dense and continuous fog, necessitating the extensive use of gas, and on that day the quantity of gas supplied to London by the Gaslight and Coke Company amounted to 103,664,000 cubic feet, or 35,000,000 cubic feet in excess of the quantity sent out by the same company in the corresponding day of last year. The above excess in the supply of gas would represent the supply to a town of from 10,000 to 12,000 inhabitants for a whole year. In addition to the quantity supplied by the company mentioned, there were supplied by the other two Metropolitan Companies — the South Metropolitan and Commercial — about 45,000,000 cubic feet, making a total consumption for London on a day of fog of nearly 150,000,000 cubic feet. Approximately, the value of this gas was £21,000, of which cost from £7,000 to £8,000 was directly due to the fog. In 1885, on a day of similar fog, a great strain was put upon the companies."

Life Insurance for Two Cents. — "Drop a nickel in the slot and insure your life" is a legend which may soon be looked for in the saloons and railroad stations throughout the land. What with musical locomotives and steamboats, and machines for testing weight and height and strength of muscles and lungs, besides automatic deliverers of candies, cigarettes and stationery, the possibilities in this line would seem to have been well nigh exhausted, but now comes a new London corporation, the Automatic Accident Insurance Box Company, with a capital of £60,000, which proposes "to provide the public with a ready means of obtaining an insurance for twenty-four hours against death arising from accidents of every description, by simply placing a penny in the slot of a box." It is proposed to place 1,000 boxes as quickly as possible in various parts of London, and subscriptions are now invited for 40,000 shares of £1 each, the balance — 20,000 — being taken by the vendor. What next? — *Spectator*.

How a Telegraph Line was protected from Native Curiosity. — According to the *Electrical Review*, when the electrical telegraph was first introduced into Chili, a stratagem was resorted to in order to guard the posts and wires against damage on the part of the Araucanian Indians and maintain the connection between the strongholds on the frontier. There were at the time between forty and fifty captive Indians in the Chilian camp. Gen. Pinto called them together, and, pointing to the telegraph wires, he said: "Do you see those wires?" "Yes, General." "Very good. I want you to remember not to go near nor touch them; for if you do, your hands will be held and you will be unable to get away." The Indians smiled incredulously. Then the General made them each in succession take hold of the wires at both ends of an electric battery in full operation. After which he exclaimed: "I command you to let go the wire!" "I can't; my hands are benumbed," said the Indian. The battery was then stopped, and the man released. Not long afterwards the General restored them to liberty, giving them strict injunctions to keep the secret, and not to betray it to their countrymen on any account. This had the desired effect, for, as might be expected, the experiment was related in the "strictest confidence" to every man of the tribe, and the telegraph has ever since remained unmolested.

Architects, Clients, and Builders. — It is a principle of law and equity that an agent is not allowed to make any profit out of the agency, without the knowledge and consent of his principal, beyond his proper remuneration; and any sums of money so obtained by an agent from any other source must be accounted for to the principal, who may claim it as money received to his use. Where, therefore, an engineer (and this case again equally refers to an architect) entered into a sub-contract with the contractor without the knowledge or consent of the employer, it was held that any surreptitious dealing between the contractor and the engineer was a fraud, and entitled the defrauded employer, if he came in time, to have the contract which was entered into without his knowledge or consent rescinded, and to refuse to proceed with it in any shape. So, on the other hand, the architect should not, without the knowledge of the builder, enter into a contract or engagement with the employer. If, besides the contract between the employer and the builder, there is a contract between the employer and the architect, not communicated to the builder, that the outlay shall not exceed a given sum, and the builder is, by the contract, subject to the orders of the architect as to what works he shall execute, this agreement is not binding upon the builder, and such restriction of the architect's authority by contract, as agent for the employer, cannot in any respect prejudice the builder's rights. And in order to enable the employer to claim the benefit of a proviso that the architect was to arbitrate in all matters between him and the builder, it is essential that the fact of such a contract as above mentioned, between himself and the architect, should have been communicated to the builder, and distinct notice of such an engagement given to him previously to his entering into any contract, as otherwise the architect would be put in a position of undue bias. If, however, the builder was aware of the agreement between the architect and his employer, and of the fact of the architect's interest in consequence, the builder would be bound. — *Alfred Emden, in the Architect, London.*

TRADE SURVEYS

Business in all parts of the country continues at a higher point than traders and manufacturers would have predicted ninety days ago. The iron-trade barometer points to clear weather and plenty of business. Railroad earnings on 101 roads for eleven months show an increase in gross earnings in round numbers of $35,000,000 over the earnings of the same time last year. Only four roads out of the 101 show a decrease. The November earnings this year are as $30 to $26 for same month last year. High railroad authorities have stated within a day or two that there is not as much cause for a curtailment of railroad-building operations next year as many newspapers writers and guessers of probabilities think. They state that there is so much territory yet to be covered by railroads, and which can be covered more cheaply now than perhaps three years hence, that it is wise not to wait for another boom in material, but to take advantage of low prices to push ahead. The necessity for covering territory is the strongest inducement to railroad construction where immediate returns cannot be relied upon. There is an outpouring of population from the East, which is silent and unobservable. There is a more important factor than is apparent. The region west of the Mississippi is quietly filling up by a thrifty population that has money to see it through any ordinary depression. Then, again, industries are being diversified, and instead of all-wheat, all-corn, or all-cotton crops, there is a diversification which enables the new comers from the East Mississippi region to utilize their labor twelve months in the year, and to make money even though the wheat and corn crop should show a decline enough to depress prices, if such were the fact. There are a great many factors beneath the surface which must be studied in their full significance before a really intelligent opinion of probabilities can be formed. The best authorities in this city, New York and Chicago justify the statement that there is a broad field for future railroad-building in this country, and that those who wait a year or two will be the first to have cause for complaint at their extreme caution. Even in the Northwest where a 20 per cent reduction in traffic rates threatens a ten million reduction in gross earnings, there is a good deal of railroad-building projected, and it will be, in all probability, entered upon. Within the past thirty days between two and three thousand miles of road have been projected in the region south of the Ohio and in the Southwest. The peculiarity of railway construction next year will most probably be the building of small lines and feeders ranging from ten to fifty miles in length, to develop territory offering special inducements for railway-building enterprise. The makers of machinery have as good opportunities of judging of future probabilities as any other class of men. The heaviest makers in the New England and Middle States could not be induced to state over their own names that there will be a serious curtailment of activity. Taking the locomotive-works we find there are prospects for an unusually active year. It will require some very serious obstacle to induce railroad-managers to reduce expenditures for locomotives, cars, equipments, stations, side-tracks, and a variety of other improvements which increased traffic has rendered necessary. With all the activity that is visible and probable, there is still room for a very conservative management. It must be admitted that margins are narrowing down in nearly every branch, but there are elements of safety which will prevent the pendulum from swinging beyond a safe limit. The little shops and shop-keepers are all doing well. A great deal of new work has appeared in sight within thirty days. The nail-makers are, of course, facing low prices. Bar-iron makers have completed the bulk of their orders, and are awaiting new ones. Iron and steel plate-makers will be in the market in January. Western machine-shops and tool-works are slackening up a little, but the dulness will not last much beyond the middle of January, according to some of the statements of some of the leading managers in those lines. The anthracite-coal-strike will probably come to an end before midwinter. The assessment made by the leaders of the strike is misleading the strikers into the belief that they will win. In a very short time stocks will begin to accumulate at New England points, New York and Philadelphia. The production last week was 55,000 tons ahead of the same week last year, in spite of the large number of idle men. The production for the year is in round numbers 2,400,000 tons ahead of last year. The confidence of the business men of the nation does not seem to have been seriously shaken by the high official utterances, and the future course of the Government in regard to economic legislation. The business men of the country have more confidence in the stability of business than years ago. Even if they should see a general reduction of duties in sight, it would not have the effect that an announcement of such a policy would have had five years ago. The necessity for tinkering is recognized, and the inevitable tendency for greater freedom of international intercourse is making many of those who were heretofore antagonistic to such a policy more friendly to it if made in the right spirit. The reports during the past week from large builders in our leading cities, show that the statements made regarding winter and spring activity were not premature. All probabilities point in the direction of activity. Country-building requirements will be very carefully entered upon. This will include a certain amount of small house-building, the demand for which is certainly in excess of the supply. In the West there is a feeling of confidence in building enterprise. The industrial activity of half a dozen railroads, the active demand for mineral, iron, steel and lumber, and the growth of a multitude of towns into little cities, all help to strengthen confidence, and to give money-lenders in the East more faith in the West, and in its permanent ability to make good all loans.

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